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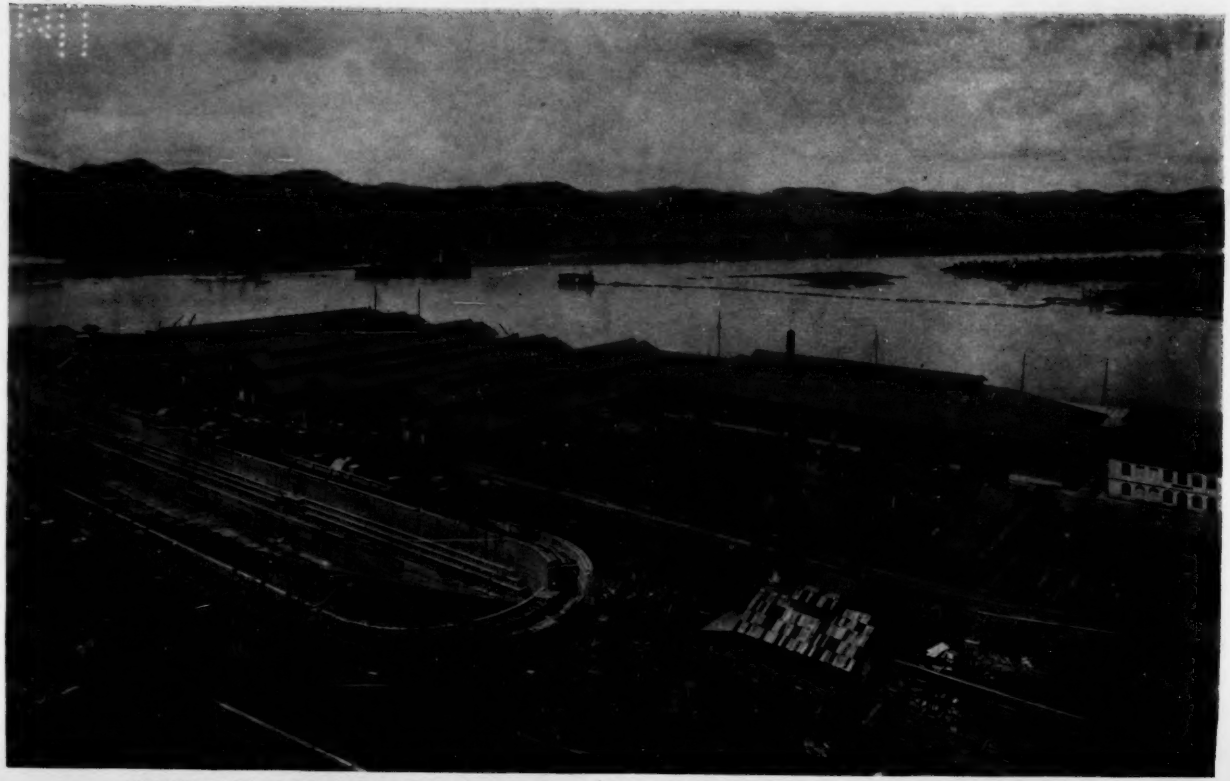

GENERAL VIEW OF PORTION OF BALBOA SHOPS, DRY DOCK No. 1, BASIN AND CANAL CHANNEL. TAKEN IN 1915

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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Third Honorable Mention, 1916

SOME UNDERLYING PRINCIPLES OF MORALE

By COMMANDER D. W. KNOX, U. S. Navy

Motto: "In war the moral is to the physical as three to one."—NAPOLEON

THE ELEMENTS OF COMMAND

Before a collection of men with a common purpose, such as a military body, can act collectively as a whole to accomplish efficiently the desired end, several things are indispensable.

First of all there must be a proficient *leader*. Without one to give direction to the combined efforts there cannot be unity of action by the body, nor mutual support between the various parts, and in consequence energy will be neutralized, wasted and dissipated. By means of a leader the collective effort may be given continuity, and individual or group effort coordinated and thus utilized to the best advantage in the interest of the common purpose.

As a corollary to leadership there must also exist *discipline*. The principal leader, as well as the subordinate leaders, must have *control* or *authority* over each of their juniors, to which all subscribe. If the authority of the leaders be weakened, control over the activities of the body as a whole is correspondingly diminished, and the effectiveness of its actions impaired. Adequate authority for the leaders is therefore necessary as a basis for command.

A further essential to efficient collective effort is *organization*. There must exist the mechanism through which each man can be

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individually directed and supervised to the end that each may perform the detailed task for which he is best fitted, and at the same time assist the efforts of all others. To accomplish this end the body of men must be divided into a number of groups, each under its own separate leader, and, if the organization be large, further similar division and subdivision of principal groups may be desirable, each having a separate leader. By such means it is possible to ensure that every man in the organization is working in such manner as will best accomplish the common purpose, and that the effort of all individuals and of all groups is coordinated to the same end.

It is obvious that the collection of men must be equipped with the *physical means* necessary to the accomplishment of their purpose.

The final requisite is good *morale,* which may be defined as sustained confidence, combined with an ardent and enduring determination to do the utmost. Much can be accomplished with such a spirit pervading an organization, that is otherwise wholly impossible.

The foregoing five factors are necessary elements of command. When any of them are neglected, the ability of any collection of men to achieve their common purpose during peace or war is correspondingly reduced. When all are highly developed the organization as a whole is necessarily efficient.

The scope of this essay only includes the last-mentioned element, morale.

Whether justly or not, it has always seemed to the writer that our navy has never been quite awake to the profound and direct influence of this factor upon efficiency. Whether the efficiency of a single ship, a fleet, or a large shore station, has been at stake, the "custom of the service" seems to have been to occupy and concern ourselves intensely with almost every other matter except morale, and to allow that to drift for itself. Of course there have been many brilliant exceptions, but as applied to the service as a whole the criticism is believed to be just. Certainly there never has been a widespread consistent effort to build up a high morale in anticipation of the service it will return during war. On the contrary there is undeniably a very general tendency to accept the inherent patriotism and racial characteristics of our personnel as sufficient, and to assume that no constructive work in the field of morale is necessary.

It is difficult to understand how such a tendency has become the rule. Unquestionably it cannot be justified on the ground of experience, for nearly every officer is personally cognizant of the detrimental effects on efficiency of "unhappy" fleets and ships wherein an "ardent desire to do the utmost" is inevitably lacking; without such a desire, confidence in the loyalty and mutual support of all, and in the successful outcome of any undertaking, is impossible. Except where contentment is based on slackness or indiscipline, "happy" ships and fleets are efficient—not that happiness in itself will surely create efficiency directly, but that a carefully nurtured morale unavoidably engenders both contentment and efficiency.

MORALE IN GENERAL

One of the best known and most often quoted sayings of Napoleon is that "In war the moral is to the physical as three to one." Whether this ratio is mathematically correct is of no material consequence; but from the military point of view it is undoubtedly very important to recognize the fact that the moral side of both peace and war activities is preeminent, and should take precedence over any other factor in the practical side of preparing for and waging war.

In both the planning and the execution of all his operations, strategical and tactical, Napoleon's principal endeavor was to undermine and shatter the enemy's morale; and conversely, he took the greatest pains at all times to elevate and sustain that of his own troops, in doing which no leader of history was so astute or so successful. Upon this paramount element of military success every other great leader of history has principally relied for victory. Nelson was second only to Napoleon in his efforts and ability to engender high morale in his own command and to destroy that of his foe. Caesar, Alexander, Hannibal, Wellington, Lee, Moltke, as well as many other great historical figures, appreciated the value of morale and successfully used it as the chief means for accomplishing great achievement.

If Napoleon's estimate of the worth of morale is accepted, which has been done by all the great writers and students of war, and which is substantiated by the experience of all great leaders and testified to by most of them, then it must be admitted that efficiency in strategy and tactics, gunnery and engineering, seaman-

ship and navigation, radio and signals, cleanliness and uniforms, and in fact in all matters to which intense attention is now directed, are after all of only secondary consequence.

No one will dispute the advantages in war of adequate and efficient matériel, nor of expertness of personnel in its use. These are indeed contributory factors of morale on account of the feeling of confidence which they bring. If, however, morale is neglected for the sake of obtaining such subsidiary advantages, or worse, if the latter are acquired by methods which undermine morale, then we are deceiving ourselves, and such efficiency as has been acquired is without firm basis. In any event the first concern should be the development of morale in a systematic, serious and well digested manner.

Experience has indicated that inherently the fighting efficiency of all the great races of mankind is about equal. The success of one race over another has usually been due to such factors as superior organization, training, leadership and armament. Except under the guidance of a great leader a decided difference in morale between opponents has, as a rule, not existed. Armies and navies have striven to excel their possible opponents in the excellence of their matériel or in the superiority of the training of personnel in its use. Rarely has a systematic or intelligent effort been made to excel through superior morale. This is all the more strange because of the importance of morale and of its relatively undeveloped nature. It would seem logical to suppose that the best chance for superior preparation over any possible enemy lies in the heretofore almost untouched field of morale.

Perhaps the most striking feature, and the greatest military lesson, of the present great war, is the almost unprecedented unity and the intense loyalty of the German nation as a whole, which inevitably extends to and permeates the army and navy of that country. It is far from improbable that when the facts are known it will be found that the German political and military leaders have studiously created this condition in consequence of a concurrence with Napoleon's belief in the preeminent importance of the moral element.

Much has been written upon the subject of morale, but nearly all such literature has been confined to a consideration of its effects. The question of practical and comprehensive means for creating and developing morale still remains an almost virgin field, to explore which is the main purpose of this paper.

Since morale is essentially an attribute of the mind, it follows that a search for underlying principles must lead us into the mental sphere. Before the body of officers can be equipped for the practical task of upbuilding morale, it must be well grounded in such subjects as the operation of the brain; the characteristics of the mind, such as feeling, emotion, sentiment; and the psychological qualities of individuals and crowds.

Once these principles are well understood, the deductive processes necessary to their practical application, are relatively simple.

THE ORGANIZATION AND OPERATION OF THE BRAIN

The human body is a great community of vitalized separate cells, similar in origin and general characteristics, but differing considerably in detail according to the function which each class has been developed to perform.

The nervous system, which includes the brain, is made up of those cells which have become specialized in the work of controlling and coordinating the activities of the rest of the body. The function of the cells of the lower nerve centers is to control the interior mechanism; such as respiration, digestion, circulation, etc. As is well known these duties are carried on automatically, and independently of consciousness. The specialty of the highest nerve centers is, however, quite different. Their function involves thinking and reasoning, by means of which the actions of the person in relation to his environment are regulated and controlled. Three things are necessary before an individual can act through his highest nerve centers:

(1) Acquire information through the senses.

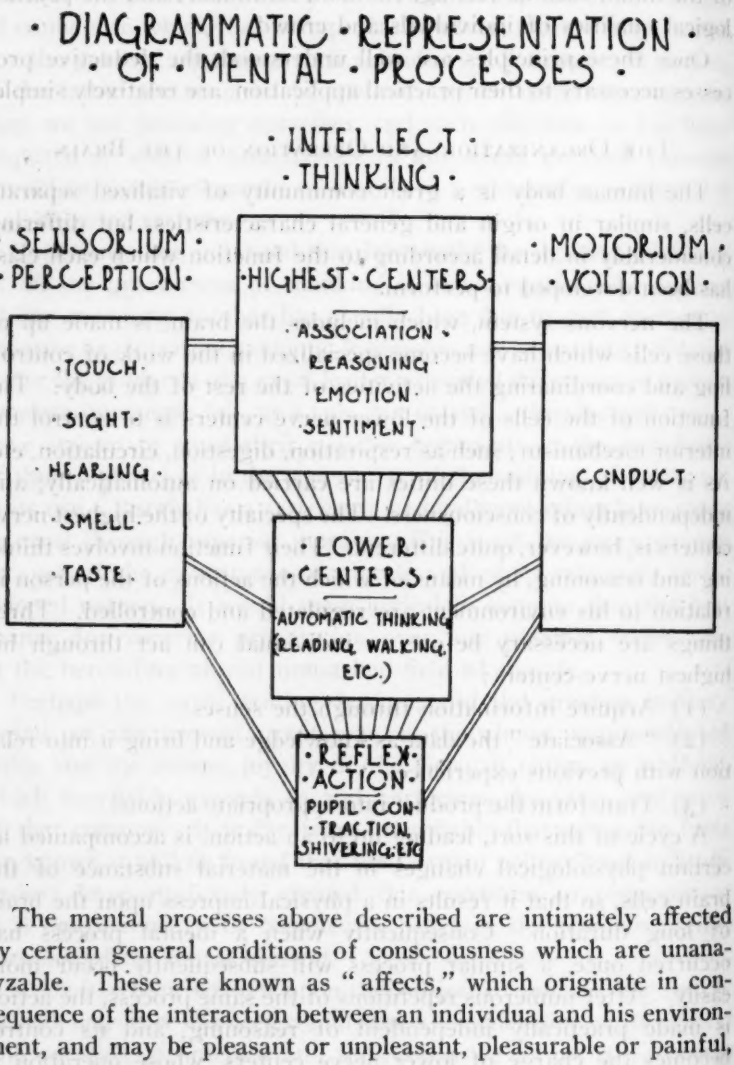
(2) "Associate" the data as knowledge and bring it into relation with previous experience.

(3) Transform the product into appropriate actions.

A cycle of this sort, leading up to an action, is accompanied by certain physiological changes in the material substance of the brain cells, so that it results in a physical impress upon the brain of long duration. Consequently when a mental process has occurred once, a similar process will subsequently occur more easily. After numerous repetitions of the same process, the action is made practically independent of reasoning, and its control becomes the charge of lower nerve centers, whose operation is automatic.

The lowest nerve centers have control of what is known as "reflex action," which consists of such processes as the contraction of the pupil of the eye, shivering, etc.

The brain processes as a whole may be diagramed as shown in the accompanying sketch.



The mental processes above described are intimately affected by certain general conditions of consciousness which are unanalyzable. These are known as "affects," which originate in consequence of the interaction between an individual and his environment, and may be pleasant or unpleasant, pleasurable or painful, agreeable or disagreeable.

An affect which is simple in character causes what is known as "feelings." For instance the sound of a fog whistle or the firing of a gun may cause a feeling which is disagreeable to the extent of being even painful. Should the incident be more complex, for example if the sound of the gun was accompanied by screams or by the sight of blood and wreckage, the idea of an accident would arise in the mind, and the result would be a state of consciousness known as "emotion." A situation involving still more complex interaction between the individual and his environment, such as the sound of gun-fire combined with screams, wreckage and blood, and with the knowledge of the presence of an enemy, would give rise to "sentiments," such as honor, patriotism, etc.

Under the influence of feelings, emotions, and sentiments, the normal operations of the brain may be greatly disturbed; this is particularly true of emotions. Physically, a marked change in blood circulation takes place, due to physical commotion in the brain cells, which liberates energy and creates a greater demand for nourishment. This results in increased heart action and an expansion of the blood vessels of the head and brain. Increased circulation induces accelerated breathing. We are all familiar with the increased heart and lung action immediately following the inception of emotion.

In addition to these physical phenomena, others of a more profound nature take place in the nervous and muscular systems when feelings, emotions, or sentiments are experienced. Most important is the interference with the functioning of the higher nerve centers of the brain, which accompanies nearly all of the emotions, by which the process of reasoning is restrained and the influence of elementary instinct and of the trained lower centers promoted; this fact is an exceedingly important one for the military student to carefully note. The detailed manner in which it is brought about is unknown, but it is certain that emotion is not localized and does not affect one section or compartment of the brain alone. On the contrary its effects are diffused throughout the higher nerve centers, and in excessive and sudden emotion the functioning of these higher centers may be even completely arrested. It may be noted in passing that the same condition is brought about by excessive physical exhaustion.

When the efficiency of the higher centers decreases, due to the brain disorganization caused by feelings, emotions, and sometimes sentiments, or by physical exhaustion, control of conduct through thinking and reasoning becomes greatly impaired—in extreme cases it becomes practically paralyzed. The function of directing conduct is then taken up by the lower centers alone; that is, by that portion of the brain which has been previously trained to automatic action by repeated performance. Under these conditions it may be said, diagrammatically at least, that the higher nerve centers have been short circuited (see diagram). In such case the efficiency of the lower centers is also impaired, because of the general diffusion of the emotion already mentioned; but except as the result of physical shock these lower centers are probably never badly disorganized.

Reflex action remains operative, as a rule, even after loss of consciousness or other cause of "short circuiting" of the lower brain centers.

It is evident that in battle, or other emergency, the reason cannot be relied upon to govern conduct. In the earlier stages fear and other emotional excitement may throw partially out of gear the operation of this normally paramount function, and actions will then be controlled primarily by habit up to the point when severe physical shock may be experienced—after which reflex action alone will be in charge.

THE EMOTIONS

The effect of emotion in general upon the brain processes, and consequently upon the action of the individual has been noted above. It is not necessary to examine in detail all of the emotions, but some of them are so closely allied to the subject under discussion that they will bear close scrutiny.

The most important of these is the emotion of fear. The desire to live is basic, and is independent of all intelligence. Fear is the defensive form of the instinct of self-preservation. It takes precedence over all other emotions, and is the most difficult to control.

In fear the muscular nerve-control, both voluntary and involuntary, is greatly diminished, due to partial or complete cessation of the functioning of the higher brain centers. As a result, "the flesh cannot be suppressed," the blood and other fluid vessels

spasmodically contract, the heart becomes spasmodic in its action, shivering and pallor occur, secretion of the saliva and other fluids is retarded; one experiences "goose flesh," cold sweats, bristling of the hair, respiratory oppression, etc. The voice becomes hoarse and broken, voluntary movement is restrained and in extreme cases entirely arrested; the pupil of the eye expands, thus interfering with accurate vision; and other "reflexes" occur. Obviously, unless controlled, fear will profoundly affect the precision and rapidity of loading; the accuracy of pointing, range finding, sight setting and spotting; the transmission of signals and radio messages; the satisfactory execution of tactical maneuvers; the judgement of captains and admirals; and in fact the efficient performance of every duty, great and small.

Our interest in fear, one of the greatest of all obstacles to military success, lies chiefly in understanding it, that we may induce it in the enemy and provide against it in our own forces. In addition to being caused by the instinct of self-preservation, fear is induced by weakness and by fatigue. Physical strength and freshness therefore contribute to its avoidance.

The effects of surprise are closely akin to those of fear.

While fear is the *defensive* form of the instinct of self-preservation, the *offensive* form of the same instinct is manifested in the emotion known as anger. It is a strange fact that, while both fear and anger have their origin in the same instinct, their effects upon the brain and body are the antithesis of each other. In anger the functioning of the higher brain centers is stimulated and the muscular nerve-control increased. Circulatory vessels are dilated and muscular activity is induced in all parts of the body. In consequence aggression, strength, pride, and feelings of power and superiority are awakened.

It is clear, therefore, that to incite anger is fundamentally one of the best methods for quelling fear. The enemy will furnish a convenient object of anger.

A third form of the instinct of self-preservation is found in the emotion of ego, or "self-feeling." A feeling of satisfaction or dissatisfaction with one's self gives rise to a consciousness of strength or weakness, and a resulting desire for appropriate action. It follows that a well developed ego is a military asset, and will assist in the subordination of fear.

Another emotion which military students should not ignore is the sexual instinct, which Ribot says "remains the center round which everything revolves; nothing exists but through it. Character, imagination, vanity, imitation, fashion, time, place, and many other individual circumstances or social influences give to love—as emotion or passion—an unlimited plasticity." Naval administration which attempts to ignore or violate this instinct is insecurely based. It may be utilized to promote contentment during peace and inspiration during war.

THE WILL

A strong will is the keystone of military character. It is the great bulwark against the detrimental effects of emotion. No great leader has been without one, and the amount of determination permeating the personnel of an army or a fleet is one principal measure of their capacity for sustained confidence, and consequently one of the greatest factors in morale and victory.

We are prone to regard strength of will as an inherent quality, acquired only through heredity and incapable of material change by training. In so far as the effect of training is concerned, quite the contrary is the case.

Through our senses the brain receives constant, innumerable bits of information concerning our environment, which originate thought and stimulate many passing impulses and tendencies to action. These stimuli are so numerous and frequent, that it is obviously impossible for the resulting tendency from each one to be carried out in conduct. It is necessary that the brain exercise some sort of selection to determine which stimuli shall be followed by action, and which ones shall be suppressed or "inhibited." "This process of the attentive selection of one way of action as against another" is a will process, the degree of which depends upon the capacity for concentration of attention. Our conduct is thus governed by the power of the mind to exclude or inhibit all tendencies which it does not desire and to concentrate attention upon a chosen tendency. The power of concentration is a quality which can be readily developed by repeated exercise in concentration; and by so doing will power is directly strengthened.

It is difficult to concentrate the mind, no matter how great the desire to do so, unless the subject is a matter which excites *interest*. Consequently, whatever means may be employed to develop con-

centration and will, they should be made as interesting as possible. Interest is invariably increased by responsibility; hence the latter is one instrument of will building.

The will is also dependent upon past experience.

> We can directly will an act only when we have before done that act, and have so experienced the nature of it. (Royce.)

From the preceding it follows that great will power may be acquired by developing a strong power of inhibition, *i. e.*, the ability to concentrate exclusive attention upon a selected objective. Also, that no matter how great the will power, it is impossible to will an act with which one is not familiar. The military application of these principles is obvious. We must familiarize ourselves and our men with the duties that will be required of us in war, and in all drills and exercises the greatest possible interest should be stimulated, and the strictest attention must be insisted upon. Mental familiarization with the processes involved is the great value derived from sub-caliber work of all sorts, including work on the tactical maneuver board and with the strategic chart maneuver. The Swedish system of physical exercises furnishes an excellent means for developing concentration and will power. If in battle we have the capacity for great mental concentration, and can furnish an urgently necessary and familiar act as the object of such attention, it must follow that mentally disorganizing emotion will be minimized through inhibition of the unfamiliar sounds and scenes of battle.

The principal reason why surprise, the great ally of strategy and tactics, is such an effective moral factor, is because it diverts the attention of its victims; thus undermining their will and opening the gates to a flood of emotion, which latter directly prevents efficient mental operation.

THE SENTIMENTS

In any effort to combat the disorganizing effects of emotion, the will may be greatly aided by sentiments. In such sentiments as pride, self-confidence, confidence in one's companions or leader, self-respect, valor, a sense of duty or of honor, conviction of the utility of discipline, patriotism, a spirit of devotion or of sacrifice, and loyalty to a cause, the physical responses are similar to those induced by anger; that is, the wits are sharpened through a stimulation given to the activities of the higher brain centers, muscular

nerve control is increased, and circulatory vessels are dilated and muscular activity induced.

To reach a high state of development in many of these sentiments, it is essential that the foundation be laid by moral training begun at an early age; while the individual is under the paternal roof, and while he is at school.

It has unfortunately come to be the fashion in our country, which we naval officers have sworn to defend, for parents and educators to seriously neglect the development in children and youths of those sentiments which are most necessary from the military point of view. Worse yet, in many quarters such tuition is even discouraged and discredited. Consequently it is true as a general statement, though naturally there are a great many exceptions, that our average recruit and midshipman is deficient, as compared with those of a highly military nation, in such fundamentally important sentiments as a sense of duty, conviction of the utility of discipline, loyalty, a spirit of devotion or of sacrifice, and even patriotism.

These facts undoubtedly constitute an element of grave danger to the national existence; more especially so when the necessity for stimulating such sentiments in our personnel is not recognized by the body of naval and military officers. At the present time the tendency in both services is to accept the material as we find it, in this respect, and seemingly to believe that such mediocre development as has been done previous to entering the service, combined with a spirit of adventure and the pugnacious instincts of the race, is sufficient, in so far as morale is concerned, to achieve victory.

No greater mistake could be made; as we shall doubtless learn to our sorrow if ever our armed forces are pitted against a service imbued with high morale.

No other part of an officer's duty, in peace or war, afloat or ashore, in whatever circumstance he may be placed, is so important as the creation of high morale within his command.

With respect to the inculcation of sentiments, the task of creating high morale is rendered difficult by our racial aversion to sentiment in general, and by the deficiencies of early education previously mentioned. This is all the greater reason for giving serious and analytical study to the matter, in order to evolve practical means for accomplishing the desired end. Making due allowance for differences in national character, it will be useful

to know the methods used in foreign services to develop the essential military sentiments.

The French are sufficiently emotional to respond readily to emotional orations; and French leaders, notably Napoleon, have raised the sentiments of their personnel to the highest pitch in this manner. The men were pursuaded of the greatness and attractiveness of the mission upon which they were embarked, and were appealed to in winning terms to give their loyal support and utmost endeavors. Recent practice in France prior to the present war was for officers to have frequent conversations with the men upon subjects calculated to instil discipline, patriotism, respect for their profession and uniform, and affection for their flag and country. These talks included examples of conspicuous French sacrifice, gallantry, and achievement; more especially by men of their own corps. The following quotation is from the introduction to a former edition of the French Infantry Drill Regulations:

> Moral powers are the mightiest pillars of success. Honor and patriotism fill troops with the noblest devotion. The spirit of self-sacrifice and the determination to win ensure success; discipline and steadiness guarantee the influence of the leaders and the cooperation of all elements.

Many years ago, when German militarism was at a comparatively low ebb, Scharnhorst, protesting against a condition in the German army which is not without its parallel in the American military services to-day, wrote "We have begun to place the art of war higher than military virtues; this has been the ruin of nations from time immemorial." To-day the German love of the fatherland and of the Kaiser is extraordinary, and is the motive for prodigious feats of valor and examples of self-sacrifice. The German men idolize the Kaiser and their officers, and have absolute confidence in them. They believe implicitly in the justice of their cause, and that they will surely win. What methods have been employed to bring about this condition are unknown to the writer. The *London Times* of March 25, 1915, published the following as being an extract from a German brigade order:

> We must do everything possible to prevent the men becoming dull and lethargic. I recommend that the men in rest billets should be given stirring history lessons, and, in particular, accounts of the present campaign. All officers must take an active interest in cheering up their men and in drawing together the various classes. Encouragement of every sort prepares the way to victory.

The British training manuals of various dates indicate in a general way the methods employed in their military services. Some of the objects of training stated by them are as follows: to develop a soldierly spirit in the recruits; to help the soldier to cheerfully bear fatigue, privation and danger; to imbue him with a sense of honor; to give him confidence in his superiors; to increase self-confidence and self-restraint; to produce a high degree of courage and disregard of self. The men are instructed in military history, particular attention being given to instances of conspicuous valor. Emphasis is laid upon the privileges inherited as a British subject, and the honor which flows from serving king and country.

In an article written several years ago, Lieutenant Dewar of the British Navy says:

> The cultivation of morale is not merely commendable, it is a necessity, and it cannot be done by lectures and blackboards alone. It requires a close association between men and the right kind of officers. . . . . The real solution is to choose good petty officers and officers and give them a very free hand. . . . . This question of ideals is just as important as questions of rate of pay, for if you have no ideals, expressed or subconscious, more pay simply spells more beer.

In the Japanese service great attention is given to the elevation of morale. To indicate their methods of inculcating military sentiments, the following extracts are made from their "Regulations for the Instruction of the Personnel in the Japanese Navy," published several years ago:

> They (officers) should fortify themselves in the sentiments of honor.
>
> The basis of the instruction of the petty officers and men is to make them acquire the disposition and the indispensable talent for battle, so that they may completely fulfil their mission and duties. At the same time with the moral instruction will be given them the habit and familiarity of the weapons of war.
>
> The moral instruction of the personnel should seek to develop the sentiment of military honor and obedience to the will of the Emperor.
>
> The principal parts of the moral instruction refer to the following topics:
>
> I. The reading and explanation of the imperial decrees delivered to the military, and to men of arms generally.
>
> II. Conferences on the constitution and the history of the empire, to cultivate in the seamen sentiments of fidelity to the person of the Emperor, and to form in them just conceptions of patriotism.
>
> III. Duties of the military to the state. Explanations regarding the use of the national flag on board vessels of war and its signification. Explanation of the signal flags, and the part that these have played in past wars,

successes of the signalmen, and the heroism displayed by them in battle, and the dependence upon signals of the fleet in battle. To speak always to the men with the idea of stimulating their sense of valor.

IV. Conferences on naval history and notable deeds which are mentioned in it, sea and land battles and acts of heroism of celebrated warriors, to inculcate the spirit of valor.

V. Conferences on discipline, and special instruction upon the obligation of obedience in military men, habits and customs which they should observe to distinguish them from the rest. Explanation of laws and regulations and customs which refer to discipline so that each person may possess the qualities in keeping with the noble and self-denying profession of the soldier and sailor. Considerations on the moral conduct of the individual in his service life respecting the rights of others, and in respect to public virtue. The obligations of courtesy inherent in all Japanese, and the observance of good conduct.

To put in practice the moral instruction, it is necessary always to find the favorable occasion to have appropriate conferences; it is necessary to observe constantly the conduct of petty officers and sailors so as to make them follow always the right path.

The naval and military men should ever have a firm resolution and should have besides an *esprit de corps*, for without it the moral instruction will have no result.

The sentiment of loyalty is so exceedingly important from a military point of view that it calls for special consideration. Human nature is so constituted that an individual cannot be contented unless possessed of a settled plan of life which includes a cause to which complete loyalty is given. This is true because each person within himself is a complex maze of inherited instincts, modified by whatever training has been received. Many conflicting impulses result which render it impossible to find a fixed plan based wholly upon inward desires. If a plan is sought from outside sources, some encouragement is found, due to instinctive imitativeness; but this soon results in a degree of self-consciousness, and causes an individualistic, critical, and rebellious frame of mind; and the imitativeness is brought into conflict with the stronger instincts of independence and self-reliance. The individual is thus thrown back upon his inner resources, which as pointed out are alone unsuited to the furnishing of a satisfactory basis for a settled plan, and the cycle of looking outward is of necessity repeated. Meanwhile the person experiences restlessness and discontent with life. The deadlock can be broken only by the selection of a cause, being loyal to that cause always, and the adoption of a settled plan of life in harmony with the cause.

Whoever is loyal, whatever be his cause, is devoted, is active, surrenders his private self-will, controls himself, is in love with his cause and believes in it. The loyal man is thus in a certain state of mind which has its own value to himself. To live a loyal life, whatever be one's cause, is to live in a way which is certainly free from many well known sources of inner dissatisfaction. Thus hesitancy is often corrected by loyalty; for the cause plainly tells the loyal man what to do. Loyalty, again, tends to unify life, to give it center, fixity, stability. . . . . Unless you can find some sort of loyalty, you cannot find unity and peace in your active living. You must find then, a cause. (Royce.)

Obviously, then, we need to have the quality of loyalty instilled in our personnel in order to ensure their contentment. That is a vital matter. More important still, it is of inestimable value in promoting unity of action and proper coordination in the execution of a plan; if its value in this connection be truly appraised, no one will gainsay that it is a military necessity of the first order. But above all, loyalty is needful to elevate morale; loyalty to a cause has been the underlying reason for some of the most astonishing sacrifices in history. One has but to review the lengths to which loyalty led the early Christians, the Puritans, the band of Garibaldi, the American Confederates, the English militant suffragists, etc., to understand the inspiration which loyalty to a cause gives, and its inestimable potential value as a moral factor in military operations.

It is most unfortunate that this priceless trait is lacking as a national characteristic in Americans. We are "untamed, restless, insatiable in our private self-will." Our form of government, our political system, our press, our ideas of the rights of the individual, and our lack of appreciation of the responsibilities which truly should be associated with such rights, all tend to undermine a spirit of loyalty. Indeed, we have even formed the habit of making light of it.

But all sound human beings are made for it and can learn to possess it and to profit by it. And it is an essentially accessible and practicable virtue for everybody. (Royce.)

What is loyalty, and how may it be created and fostered?

Loyalty is the "willing and practical and thorough-going devotion of a person to a cause." It is never mere emotion, because the type of devotion required involves a degree of restraint and subordination of natural desires to the cause. "The loyal man serves." He exercises such self-control as may be necessary to

inhibit impulses which are selfish or in any way contrary to the dictates of the cause.

> Loyalty is contagious. It infects not only the fellow servant of your own special cause, but also all who know of this act. (Royce.)

A suitable cause to call forth genuine loyalty must be external to the will of the loyal individual, and must appeal to him as something "larger than his private self"; it must also include a tie which requires cooperation with other persons.

Before an individual is ready for true loyalty he must be capable of conceiving the nature of the cause, be self-disciplined, and have learned fidelity.

> Loyalty means giving of self to the *cause*. And the art of giving is learned by giving. Strain, endurance, sacrifice, toil, ... these are the things that most teach us what loyalty really is. . . . . The partisans of war often glorify war as a moralizer of humanity, because, as they say, only the greatest strains and dangers can teach men true loyalty. . . . . Fair play in sport is a peculiarly good instance of loyalty. . . . . The coach or the other leaders in sports to whom fair play is not a first concern, is simply a traitor to our youth and our nation. . . . . As to other ways in which the loyalty of our youth can be trained, we still too much lack in this country, dignified modes of celebrating great occasions. (Royce.)

The methods of training for loyalty may be summarized as follows:

1. By the influence of personal leaders. These should be eager, earnest, and enthusiastic, and if possible convinced—or at least capable of conveying the impression of being convinced. They should be persistent and fittingly aggressive.

2. *By idealizing the cause.* This is most important.

3. By subjecting the loyalized persons to "great strains, labors, and sacrifices in the service of the cause." In this way loyalty is perfected.

Another potent sentimental factor is tradition; which is very valuable in itself to stimulate morale directly, and is also useful to the same end indirectly through feelings of loyalty which are fostered by it. Merely because they are not generally well known to the service, the very fine traditions of the American Navy are almost valueless to the present day personnel. There is every reason why this important moral asset should be utilized to the limit of its possibilities.

We officers must prepare ourselves for the work of leaders. We must formulate the cause or causes, idealize them, cultivate high traditions; and then labor continuously and faithfully at the task of creating and fostering a spirit of true loyalty in the service, to the end that, in peace or war, contentment may prevail, proper initiative be permitted, effective unity be obtained, and a high morale dominate the naval service.

MENTAL QUALITY OF RECAPITULATION

In the development from infancy, each one of us passes through certain mental epochs, which correspond to the epochs through which the race has passed in previous ages. Depending upon the individual and his environment, some may pass through these epochs quickly and some slowly, but it should be recognized that each step is necessary and cannot be skipped. The key to a proper estimate of a person, and his successful handling and direction, may often be found by determining the epoch through which he is at the time passing, which in many cases does not coincide with the epoch due to age in the normal person. To attempt relations which presuppose a more advanced epoch must result in failure.

This theory is clearly expounded by Professor G. W. Fiske in his work "Boy Life and Self-Government," in which he gives substantially the following table, for the normal person:

Boy epochs					Race epochs
Stage of life	Age, years	Characteristics	Will progress	Allegiance	Racial prototype
Infancy.....	0–3	Before self-consciousness	Self-discovery	Blind	Pre-historic period
Early childhood...	3–6	Self period	Self-control	Father	Patriarchal
Later childhood...	7–11	Clique period		Chum	Savage kinship, clan
Boyhood.....	10–14	The gang period	Comradeship	The gang	The tribal period
Early adolescence.	13–15 Grammar school age	Chivalry period	Personal loyalty, obedience	The hero	Feudal period
Middle adolescence	14–18 High school age	Self-assertive period	Self-reliance through struggle	The ego	Revolutionary or constitutional monarchy
Late adolescence..	17–24 College age	The cooperation period	Leadership, resource, firmness	The state	The republic. Social-democracy in a self-governing state.

SUGGESTION, AS IT RELATES TO THE INDIVIDUAL

If an action be proposed to a person in a normal state of mind, he may or may not adopt the suggestion, according to whether or not he sees any objection to the proposed action and has any impulses favorable or contrary to it. In exercising his volition in the matter, the person will most likely use his reasoning power and his will, modified to some extent perhaps by sentiment and emotion.

Should the person be in a state of absent-mindedness, or be in the act of concentrating his attention deeply on something, his will power and reasoning faculties will be partially eliminated from participation in determining the acceptance or declination of the proposal. We have all seen illustrations of this principle. Suppose for example it should be said to a man who is "wool-gathering," or to one who is playing a game of chess, "Have a cigarette." Often times the person addressed under such circumsttnces will take a cigarette, and then after taking it say something to this effect: "I really did not want this cigarette, and don't know why I took it."

In the condition of mind just illustrated, where the will and the reason are partly inhibited, a person is said to have "increased suggestibility"; by which is meant that he is more likely to respond to a suggestion of action, than when his mental faculties are wider awake. The degree of suggestibility depends directly upon the degree of inhibition of the reason and the will.

In addition to the situations mentioned, suggestibility is increased materially under the influence of emotional excitement, over-fatigue, alcohol, and certain drugs.

The maximum of suggestibility is reached when a person is under a hypnotic spell, because in that condition the will and reasoning processes are practically wholly suppressed.

A naval officer's professional interest in the foregoing is limited to noting that states of concentrated attention, emotional excitement and over-fatigue, produce in the individual a condition of increased suggestibility that is in an increased readiness to adopt propositions for action.

THE PSYCHOLOGY OF CROWDS

Anyone taken as an individual is tolerably sensible and reasonable. As a member of a crowd he at once becomes a blockhead.

This old statement by Schiller has its basis in certain psychological principles, the reasons for which are not easy to understand, but which nevertheless are well established, and should be perfectly well known to anyone who has to deal with or to lead any form of crowd.

The most important of these principles is that suggestibility is greatly increased in any close collection of persons having an interest in common; such as a mob, a crowd, a theater audience, a turret crew, a regiment, a ship's company, a fleet.

We are all familiar with the phase of crowd psychology manifested in a theater. Through increased suggestibility persons of unemotional temperament will laugh or cry for reasons which, were the crowd not present, would be entirely insufficient to cause such effects.

The closer the contact between individuals of a crowd, and the stronger the bond of common interest, the greater will be the resulting susceptibility to suggestion. In a fleet the larger units of the personnel are separated by the distance between ships, and in a ship by smaller distances and by bulkheads, and these facts reduce the suggestibility; but on the other hand the strength of the bond of common interest and of unified effort increases the suggestibility. Nelson's famous signal before Trafalgar was a suggestion which fell on ground fertilized in accordance with the principles of crowd psychology.

Suggestions once conveyed to a crowd are extremely contagious, and spread throughout it like wildfire on a prairie.

The increased suggestibility of a crowd renders it receptive to two forms of suggestion: (1) a suggestion of immediate action, and (2) a suggestion that it believe in certain ideas or doctrines which are affirmed.

(1) The most effective means of conveying to a crowd a suggestion of immediate action is by example—more especially the example of a recognized leader possessing high prestige. Another means is by verbal direction or persuasion.

The cry of "Fire!" in a theater will at once transform a crowd of persons, who may be fairly self-contained, reasonably clear-

headed and cool in the face of moderate danger, into a mob of apparent lunatics, so panic-stricken that they will wildly rush in a body to the exits, thus creating a situation of graver danger than that due to the fire itself. Incidents of this sort are of frequent occurrence notwithstanding the fact that the dangers of being crushed and trampled at the exits are well known; and often times the people who rush to escape from the building do so in spite of a previous deliberate and contrary strong resolve.

All that is necessary to stampede the audience in this senseless way is for one person to suggest, verbally or by example, that a move should be made to the street. There is a case on record of a singer, on the stage, who averted a catastrophe at the exits, by beginning to sing in a loud voice, thus suggesting to the crowd that no danger was imminent and that they should keep their seats.

The famous reply of John Paul Jones to a demand for the surrender of his vessel, "We haven't yet begun to fight," was an inspiring suggestion to his own crew, and a discouraging one to that of his opponents, which, according to the principles of crowd psychology, doubtless contributed in no small measure to ultimate victory for him. Farragut's, "Damn the torpedoes; go ahead!" was no less an inspiriting suggestion than an order; as was also, to the ships which were following, the action of his flagship in steaming boldly through the mine fields.

(2) If the object be to impregnate the crowd mind more slowly, with ideas, doctrines, or beliefs, other means should be employed. In the first place simple affirmation, free from reasoning, is a very effectual method. The affirmation should be repeated at intervals; if other impressions intervene between the repeated affirmations, the effect is three times as powerful as if the repetitions were not relieved of monotony by varied impressions. The effect of the last impression given is very great; it is said to be three times as powerful as the combined influence of repeated affirmations with intervening impressions.

These methods are employed by nearly all great speakers. Most of the epoch-making speeches of history are in accordance with such rules; that by Patrick Henry with the theme "Give me liberty or give me death," being a notable example in American history. In naval matters the methods could be used to advantage in "indoctrinating" a turret crew, division, or ship's company. Doctor Leys has pointed out the possible application of the same

principles under the conditions attending a destroyer making a night torpedo attack:

> The officers repeat from time to time, "We'll have them just where we want them bye and bye." This and similar suggestions are frequently made. When the time has come to advance to the attack, the order for speed and helm is accompanied with the suggestion, "Now we've got them." Under such conditions each man will be inspired by the suggested confidence in the result.

Similar methods may easily be devised for a turret or broadside battery crew, while standing by for, and beginning, action.

In general, both for individuals and crowds, certain conditions are more favorable than others for increased suggestibility. They are as follows:

1. A state of concentrated attention on a subject to the exclusion of all else.

2. Monotony—external surroundings remaining the same; such as engine vibration, the roar of blowers, the sound of waves, etc.

3. Restriction of voluntary bodily movement, such as obtains in turrets, conning towers, etc.

4. Fatigue.

5. Emotional excitement; more especially fear of the unknown. This latter very readily leads to panic, and should be particularly guarded against by acquainting all in moderate terms with what is about to happen, as far as can be done.

6. Immediate execution. This is most important in suggestions for immediate action. Should an appreciable pause be introduced after the receipt of the suggestion and before execution begins, then the reason becomes operative and the will prescribes the procedure to be followed.

Another cardinal principle of crowd psychology is that persons comprising it lose their sense of individual responsibility. The individual consciousness is replaced by a sense of being but one grain in a sand-heap. In military services this effect is, however, considerably modified by discipline and training, as a result of which in battle and other combined evolutions the individual feels a degree of responsibility to perform the duties assigned him, even though such feelings may possibly be less than under normal circumstances. In any event the previously mentioned mental tendency to automatically do what one has been habituated to doing, even when the higher brain centers become paralyzed,

largely eliminates the danger to military success incident to the reduction of the sense of responsibility.

The collective mind of a crowd lacks those higher brain centers whose function is to reason. Of the higher centers it possesses only those relating to emotion, and consequently acts only on instinct, as modified by emotion and suggestion. As previously explained, the lower brain centers of the individual automatically carry out, in response to stimuli from the senses and in harmony with the decisions of the higher centers, certain actions which habit has prepared them to do. The "crowd mind," through its lower centers, acts in a similar way. The tendency of discipline is to inhibit emotion, but rarely can it wholly do so. Under the tenseness of battle, emotion may become so great as to completely suppress the emotional centers of the crowd's mind, and hence cause conduct to be governed wholly by the lower centers; that is, by habit.

Still another principle is that crowds possess fundamentally the quality of fanaticism in their loyalty to a cause. This extremely valuable quality should be used to the utmost by officers, in their endeavors to attain military success.

Finally, an essential principle of crowd psychology is the inherent existence of an overpowering craving to be led, which is manifested even in crowds of animals. The psychological influence of a leader upon a crowd depends largely upon his prestige, and is also measured by his words, looks, example, and will. Above all, to effectively sway a crowd, earnestness must be exhibited. Especially in time of danger and other emotional conditions do men instinctively look to their officers or other leaders for guidance, and readily accept whatever suggestion emanates from the latter. Evidences of self-possession, confidence, courage, resolution and decision in the leaders are reflected psychologically among the men. So are the converse undesirable qualities reflected. Vigor of utterance and action are very potent in their influence.

PRESTIGE

"Prestige is the mainspring of all authority." It is "a sort of domination exercised on our minds" for reasons of sentiment which cannot be explained. Merely by virtue of the fact that a person holds high office, is influential, has a wide reputation, is

rich, or possesses a title, he is invested with prestige irrespective of actual personal merit. A judge's robes, an officer's uniform, a policeman's or a conductor's uniform, and a secret service man's badge, are alone sufficient to endow them with a certain degree of prestige.

Prestige also springs from other sources of more meritorious basis. For example, cleanliness and neatness of personal appearance, good manners, *savoir-faire,* self-possession and poise are instruments of prestige.

Still another form of prestige emanates from personal magnetism. Most great leaders of all ages possessed such magnetism as an inherent quality. It is difficult to acquire through cultivation alone, but like most human qualities may be improved through effort.

To fortify the prestige given them by their uniform and position, all officers should aim to improve their general prestige by cultivating uprightness, justice, character, good manners, self-possession, poise, personal magnetism and forcefulness. The assumption of these qualities, as far as possible, to a greater degree than they actually exist, will assist an officer's prestige.

In obtaining ready acceptance of a suggestion, or willing obedience to an order, the prestige of a leader is more potent than his intelligence, knowledge, efficiency, paternalism, or severity. Prestige is one of the most essential of all qualities that an officer should possess; and its acquisition should be his chief concern in any effort towards self-development.

All military nations make special efforts to build up and foster the prestige of the officer corps of their military services. Von der Goltz says:

> In the most trying situation which is possible in life—namely in the face of death—it (the officer corps) is called upon to lead a mass of men, and still preserve its influence over them. To do this invaluable qualities are demanded . . . . and this is only rendered possible by the institution of a special class. . . . . To the officer there is, accordingly, due of internal necessity, a more favored position in the state. *Noblesse oblige.* He who is accustomed to regard himself as belonging to a special class will also, in war, consider himself bound to do something special. . . . . His duty is to command and to lead and he must therefore feel what he is, and be proud of his position; and there is no harm done if he is somewhat more puffed up with a sense of his own importance than would under other circumstances be absolutely necessary. . . . . (It is) more true to-day than when it was spoken in Rüchel's saying "the spirit animating the officer corps is the spirit of the army."

Of course the German view-point upon this question is more extreme than could be tolerated in a country of such highly democratic beliefs and institutions as our own. No one imbued with the spirit of America would for a moment advocate copying the methods of Germany or those of any other military monarchy. But we should not close our eyes to the principles which lie back of such methods, nor fail, in our own way, to build up the prestige of our officer corps by means compatible with American customs and ideals.

THE PSYCHOLOGY OF THE OFFICER

It is obvious that all officers should thoroughly understand the preceding principles if they are to be able to scientifically build up morale during peace, to stimulate it to the pitch required in war, and, during battle, to guard against fear and panic and to inflame the spirit of their subordinates to the extreme degree which the issue of an action, and perhaps the fate of the nation, demand.

It is not sufficient that the officer corps should merely have knowledge of these principles; it should be intimately versed in the practical application of them.

Even more, however, is required of the officer. He is made of the same clay as the men, and consequently is subject to the same human influences and frailties. When present with the turret crew, the division, the ship, or the fleet, he is not immune from the increased suggestibility, the craving to be led, a reduced sense of responsibility, and other psychological characteristics of a crowd. He experiences the same emotions as the men, and suffers the same difficulties of keeping emotion under the control of the will.

A prime requisite in an officer is will power. He can never possess too strong a will and therefore should cultivate it assiduously. The means available for developing strength of will through interest and repeated mental concentration have been already explained. Like all other qualities will power cannot be brought to a high state of development unless exercises in it be carried out frequently; the practice of habitual self-control in daily life offers a ready and inexhaustible means for the exercise of it.

This quality, strength of will, is one which will stand an officer in good stead under a great variety of circumstances. In time of

peace it helps to combat the tendency towards inertia, experienced under some conditions of service, and to bear up under the strain of exhausting work demanded by other conditions. It assists in inhibiting irritation and depression and in maintaining a cheerful lightheartedness in the face of difficulty and discouragement. The inclination to avoid responsibility may be overcome through it. Will power makes possible the pursuit of a purpose, whether it be great or small, with firmness and tenacity, as well as the maintenance of a conviction of ultimate success in spite of adverse events. Bulow says, " One is never whipped so long as he refuses to believe that he is."

Even the bravest men often have an instinctive and strong dread of battle, which manifests itself in the form of nervousness on the eve of an action. Preoccupation with various minor duties at such a time greatly helps to neutralize this dread, but a strong will to inhibit thoughts of approaching danger is of greater importance then, and also later when the first emotional impressions of actual battle are experienced. Those in high command require such will power not only to control misgivings on account of danger to their person, but also to sustain their courage to demand great deeds of their subordinates. History shows that men possessing the resolution to demand extraordinary heroism are fewer than those willing to undertake deeds of that caliber.

The need for a strong will is much greater for officers of high rank afloat than for those ashore. The general and even the colonels of an army usually take station sufficiently in rear of the firing line to ensure the normal operation of their mental processes. But afloat the admirals and captains are more exposed to the effects of fire than most of those under their command. Consequently the tendency is strong for the emotions to suppress the higher mental functions and for conduct to be governed solely by the lower, or automatic, brain centers. This tendency can be overcome, and the reasoning powers maintained, only through the exercise of strong will power.

By profession, we naval officers are committed to purposely sacrifice our lives, if necessary, for the benefit of the nation. Should the day of final reckoning find us unprepared? It will so find us unless we are then possessed of great strength of will.

Another form of will power which officers should cultivate is that required to shake off the psychological influences engendered

by the presence of a crowd, and to develop in themselves the power of suggestion. To repress in one's self the suggestibility and other peculiar characteristics created by a crowd demands much practice and a very strong will; but even greater will power is necessary to the person who would command the unflinching firmness necessary to impress his own suggestions upon a crowd. Extraordinary suggestive power is particularly demanded if it be desired to overcome a suggestion already received by a crowd and to substitute a reverse suggestion—for example to stop a panic and transform it into courageous enthusiasm; yet Napoleon, Sheridan, and others, have succeeded in doing so, and anyone's abilities in this respect may be greatly improved by cultivating will power.

The potent influence of example upon the actions of a crowd has been already explained. Officers must prepare themselves to set that kind of an example through the exercise of will power, and also to show an example in everyday life which will exert constant pressure for the steady upbuilding of morale in general.

Hand in hand with the development of will power should go the cultivation of those attributes which increase the force of the example set by officers. Every officer should cherish his prestige as second only to his honor; and promote it accordingly. Prestige is established by reputation, successful accomplishment, and personal attainments; and is fostered by self-confidence.

One need not stoop to cheap advertisement, but can further a good professional reputation by devotion to study, and to the naval service, and by jealously guarding his standing on every occasion when it may be even remotely jeapordized. Care should be exercised to successfully complete each task that may be assigned or be undertaken; otherwise prestige will suffer by each failure.

As for personal attainments, those strictly professional are obviously necessary. But alone they are not sufficient. An officer should enrich his intellect and broaden his outlook along many lines which may be only remotely related to professional matters. This field is almost limitless, but among subjects in this category which are too often neglected, are current events, national and world politics, good literature, industrialism, finance, economics, psychology, philosophy, etc. The process of self-development of this kind should be carried on both through study and through association, whenever possible, with men of affairs and people of high intellectual standing.

The value of poise, as an aid to prestige and to the influence of example, is so great that it should be studiously cultivated. Other personal attainments of much importance to an officer are self-confidence, a vivid imagination, an agreeable manner, a cheerful disposition, a sense of humor, and bodily vigor. Last, but not least, the inspirations and ideals must be kept very high.

By these means may an officer increase the force of the example set by himself.

There is still another phase of the psychology of the officer which is of supreme importance in its relation to morale.

The officer must have a deep emotional interest in his profession and in the navy. It is not sufficient that his interest be based upon such motives as earning a living and promoting his career and position.

> But motives on a much higher level, motives which do not refer to the individual as such, but to ideal aims and purposes must be intimately associated with the personal ones. He must feel joy in the service as such, he must have interest in the details of the work and in the problems which it offers, he must be determined by a consciousness of duty which gives him perfect satisfaction when he is loyal to his task, whatever sacrifices it may demand. (Munsterberg.)

Before an officer can reach such a state of mind it is necessary that he deliberately pass through a period of analytical introspection, and carefully orient himself with respect to the navy, and the navy in relation to the nation. While he may entertain a desire for world peace, it is essential that he become convinced of the impracticability of such a millenium during the present stage of the world's development, while such great varieties of races, customs, religions and languages obtain, and while populations and wealth are so unequally distributed. It will be still better if he can reach an inward settled belief in the divine utilitarian purpose of war; a conviction that war is but one of many so-called evils, but in reality blessings in disguise, which the Almighty has in his wisdom given to us. It is not an illogical theory that pain, suffering, privation, poverty, sorrow and the like are woven into our lives for the purpose of exercising, and thus developing, our character; nor that war has a similar mission. Remembering the fundamental Christian doctrines of love and self-sacrifice, in connection with the unqualified words of Christ, "Greater love hath no man than this: that a man lay down his life for his friends,"

who can say but that participation in a just war is practicing a high form of Christianity.

He (the officer) must grasp the fundamental rôle of war in history as the great vehicle of progress, as the great eradicator of egotism, and as a great educator to a spirit of sacrifice and duty. (Munsterberg.)

Without some such conclusions, firmly held, a deep emotional interest in the navy is impossible; with them an officer is irresistibly led to an enthusiastic belief in an idealistic mission for the navy, and he can scarcely refrain from zealously adopting the furtherance of the navy's interests and those of the nation as the idealized cause to which he will give whole-hearted, devoted and life-long loyalty.

Once loyalized through inner conviction in this manner to an idealized purpose the influence of an officer in building up morale becomes very great. No matter how trying or how monotonous his work, "the cause" furnishes inspiration for its perfect performance. His example is contagious to other officers with whom he may be associated, and to men and officers under his command. When the body of officers become ardent disciples of this sort, they will inevitably saturate the entire service with intensified loyalty and virile morale, which must also be reflected in the nation.

A navy so permeated cannot fail during peace to persist in the face of every difficulty to prepare itself for war, physically, mentally, and morally. When war breaks out it will embark upon the campaign, not merely with enthusiastic patriotic fervor, which our own history has shown time and again will cool rapidly under the test of real hardship, but with an inflamed spirit which will be sustained in spite of whatever danger, privation and suffering may be encountered. Our officers and men will then go into battle with irresistible fanaticism, yet with nerves and muscles under such control as to ensure precision of thinking, loading, pointing, sight setting, range finding, spotting, plotting, position keeping, and all other operations essential to efficient fighting. Determination to win will endure, in spite of ghastly casualties, until victory is attained.

CONCLUSION

The present great war in the Eastern Hemisphere has brought to light and emphasized many new phases of war, the relative importance of which are often over-rated merely because they are

novel. Among these may be mentioned submarines, air-craft, and the stupendous use of artillery and munitions. Many prominent men even go so far as to say that war is now principally a question of munitions. No greater mistake could be made than to be misled by these new aspects, and not to recognize the fact that from the dawn of history similar novelties have come to light in almost every great war without changing fundamental principles in any material manner. In common with many other elements, efficient and adequate material is necessary; no one will dispute the fact; but physical means can never rise superior to "the guiding hand and the directing brain."

Morale is basic. It is of supreme importance, during peace or war, at all times, in all places, and under all circumstances. These facts have been proven an endless number of times in all ages; they are being demonstrated daily at the present time; they are incontestable.

While few are ready to deny these truths, the problem of how to elevate morale—the practical means of doing so—has been traditionally baffling. It is hoped that the foregoing essay may stimulate interest in this momentous subject and indicate the manner by which high morale may be created and sustained.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

OUR BATTLESHIP PRACTICE CRUISE

By EDGAR STANTON MACLAY

One of the many valuable results, of the battleship practice cruise, of August 15 to September 9, was the "introduction" of the navy to the public. It is doubtful if half of the people living in the United States to-day ever saw a war craft. Certain it is that few, very few, ever have been aboard a battleship in actual service conditions. For many years the public has regarded the navy as some far-off organization, completely removed from the every-day life of the working citizen, concerning which they had little practical knowledge, and consequently, less personal interest.

The writer of this article, like many others who volunteered as a sailor for this cruise, thought he knew something about fighting craft. Many of the volunteers were men who had had more or less practical experience in seamanship. Some of them were expert sailors. But this cruise in battleships under actual service conditions was a revelation. It showed in a striking manner how little the public really knew about the requirements of the service and it gave the volunteers an insight to the great work done by navy officers and enlisted men in maintaining our first line of national defense at its highest point of efficiency.

If for no other reason than that of serving as an "introduction" of the navy to the American public, the battleship cruise was a pronounced success. Under our democratic form of government, the information the masses receive by word-of-mouth always has had greater weight in their consideration than that which they gain through newspapers and general literature. That which they have seen with their own eyes and felt with their own hands always has had greater weight in governments by the people. The 2000 and more volunteer civilian sailors who manned the nine battleships that put out of seven American seaports last August 15 and 16, and went through all the duties of regular man-of-

warsmen during the four weeks of the cruise, returned to their homes and places of business with a new account of the services rendered by the navy. They are telling their friends and those friends are telling other friends and by this means they are bringing the navy into the closest touch with the interest and confidence of the public—and that, under our form of government, is a matter of inestimable value both to the navy and the public.

Another fact of national importance, clearly demonstrated by this cruise, is that the maritime spirit of the American people is not dead. In the first 100 years of our career as a nation, we were, preeminently, a seafaring people. Our achievements on the ocean form the brightest pages in our history. American maritime enterprise and success became a by-word among the nations of the earth. Our sea forces in the revolution accomplished "wonders" which historians have not as yet done full justice to. Our naval operations against France and the States of Barbary aroused the admiration of Europe. American successes on the sea, during the war of 1812-15, form one of the surprises in naval history while naval architecture throughout the world was completely revolutionized by American sea genius in our Civil War.

Keeping pace with our belligerent craft were our mercantile enterprises on the ocean. American trading vessels literally "forced" their way into all corners of the globe. American "bottoms" were to be found in every sea mart, in keen competition for the carrying trade of the world. American models were copied as the best afloat and even the highly prejudiced Charles Dickens was compelled to admit that our packet ships, plying between the new and old worlds, were the best.

All this was before the Civil War threw its damper on our maritime activities. As we look over the history of this country, we wonder at this remarkable sea adaptability displayed by the American people. They inherited it from the greatest seafaring races this world has produced. The 13 original colonies were settled by descendants of the greatest sea-kings. The Portuguese (the state of Maine to-day being largely inhabited by descendants of that race), Spaniards, Dutch, Scandinavians, French and English, all at some period of their careers were dominant on the ocean. These were the first settlers of our original 13 colonies.

And the geographical, physical and local environment of these colonists tended to foster their aptitude for the sea to an extraor-

dinary degree. They were dependent on the ocean for most of the necessities and luxuries of life. It was on the ship that they depended for transportation of commodities from the old world and for forwarding their products in payment of the same. They were largely dependent on deep sea fisheries for sustenance and cargoes of export, while intercolonial communication was more easily carried on by water than by land.

Through a mistaken national policy, pursued for the last fifty years, this extraordinary maritime adaptability of the American people has become dormant. That it is not dead, was completely demonstrated in the battleship cruise. The enthusiasm and ease with which these volunteers entered upon their difficult and unaccustomed duties, showed plainly enough that the blood of those ancient sea-kings is still coursing through the veins of the great mass of the American people. These volunteers represented a great variety of professions, callings and trades. Of the 300 aboard the *Maine* (in which ship the writer served) more than a hundred were college men. Four of them were clergymen from prominent churches: the archdeacon of the Episcopal cathedral at Garden City, Long Island; an associate rector of St. George's Episcopal church in New York City, the associate pastor of the Brick Presbyterian church on Fifth Avenue, New York City, and an assistant rector of the Cathedral of St. John the Divine of New York City. These distinguished clergymen performed all the menial work required of them (from standing watches to scrubbing down the decks, cleaning compartments and acting as mess-boys and "strikers") with uncomplaining cheerfulness.

Nearly every other profession, such as the law, medicine, college and school instructor, journalist and literature, was represented. Then there were the tradesmen, machinists, boiler-makers, newsboys and general utility men—all of whom took up their various duties without distinction as to class, color or creed. The work was hard for them, and the hours were long. Placed in a radically strange environment, under conditions that were peculiarly difficult to understand, they performed their duties with a zeal and intelligence that frequently elicited the commendation of the officers.

It cannot be said that these volunteers were actuated by the prospect of a "pleasant summer's outing at the expense of the government." To most of them the hard work was not pleasant. Being unaccustomed to this new routine of life, they found the

work very hard. Most men find it difficult to get their proper rest in a strange bed. In this instance they had no bed at all to sleep in and most of them, being unaccustomed to hammocks, found their night's rest greatly curtailed. This, coming after a day of hard and unaccustomed toil, was a severe strain.

Nor was there any suggestion that the cruise was at the government's expense. On the average the cruise represented an expenditure of about one hundred dollars to each volunteer. Each paid $30 down in cash to cover equipment and mess expenses. Others went to considerable expense in purchasing additional equipments and " personal comforts " which naval regulations did not supply. Many paid out large sums in travelling expenses to reach their ships. Ordinarily the usual civilian vacation is limited to two weeks. These volunteers gave an additional two weeks of their time for this service (without pay from their employers or compensating revenue from their several lines of business or work) so, when we come to total the sum of expenses in money and time, it will be found that each volunteer advanced on the average of one hundred dollars for the privilege of serving four weeks on Uncle Sam's battleships. For considerably less than this sum, these volunteers could have spent four weeks at the ordinary summer resorts. It was not a " pleasant summer's outing at the expense of the government," therefore, that induced these volunteers to embark on this cruise. They performed many tasks that were not pleasant, they worked hard and long and paid, on the average, one hundred dollars cash for the privilege of demonstrating their patriotism.

Special effort was made by the writer to learn from his shipmates aboard the *Maine* (and the volunteers in that ship may be taken as typical of those in the other vessels in the practice fleet) what their motive was in entering on the cruise. The novelty of the idea appealed to many but the main motive, in almost every case, was patriotism. As one volunteer expressed it: " I had heard so many conflicting reports about conditions prevailing among enlisted men in the navy, that I was desirous to determine for myself just what they really were. And I am very glad that I came and saw for myself. It has been a revelation to me and will prove a pleasant surprise to my friends on shore when I tell them about it. I had heard much about the quality of the food given to the enlisted men. I took special pains to notice that the

regular sailors of the *Maine* had precisely the same kind of rations as we did. Those rations were surprisingly good; better than I have had in some of the boarding-houses at which I have lived and good enough for the home of any plain, hard-working American citizen. Of course we dispensed with table linen and the manner of serving the food seemed a little rough at first, but we soon got used to that, and with appetites whetted by bracing sea air and hard physical labor, we soon came to enjoy our meals immensely."

The above fairly represents the opinion of nearly all the volunteers aboard the *Maine*. Some of the "rookies" found fault with the manner in which the food was served, but none of them as to its quality or quantity. It was in the matter of sleep, however, that most of the volunteers experienced their real troubles. The hammocks were stretched high up to the deck beams—and the height looked formidable to many. On the first night, there was a tendency to look around for step-ladders but, failing in that, inverted buckets and mess benches came into requisition as "mounts" for their "lofty beds." One stout gentleman was too proud to resort to such landlubberly devices and made several ineffectual springs to reach his hammock. Bracing himself for a more determined effort, he over-shot the mark and came over the other side, clinging desperately to the aerial bed with both hands and legs. It required only a few nights of practice, however, to enable most of the volunteers to gain their "roost" with a degree of grace.

But the seriousness of the sleep problem did not end there. Few of these amateur man-of-warsmen were accustomed to rising at five o'clock in the morning, and quite as few had the habit of "going to bed" promptly at nine o'clock at night. They complied cheerfully with regulations and retired to their hammocks on "taps" but Morpheus visited few until some hours later. The strangeness of the surroundings combined with an unaccustomed "bed" kept many awake—so long, in fact, that five o'clock in the morning came round all too soon. How to make up for the lost hours of sleep was a problem few solved successfully. Drills were continuous and sometimes exhausting. The hard decks formed but a poor substitute for a bed, while emergency drills at any hour of the night made sad havoc in the sleep of the novices. No wonder, then, that the bo'swain's mates found these rookies a hard lot to arouse at five o'clock in the morning.

Many of the volunteers swung their hammocks on the open decks—on the fo'c'stle, boat deck and the after part of the quarter deck—which insured "nature sleep" and greater ease in climbing into hammocks. One adventurous rookie swung his hammock under the open grating of the bridge. One night, however, a ten-quart can of piping hot coffee was brought on the bridge for the refreshment of the men on duty there. Unfortunately, the can was upset and the steaming fluid poured down on the sleeper below and rapidly formed a puddle in the hollow of his water-proof hammock. He performed the "lightning-change act" and thereafter gave the bridge a wide berth.

A feature of the cruise, which greatly impressed the volunteers, was the system of physical exercise to which they were subjected from the day of embarkation to the termination of the voyage. These exercises were freely discussed and the general opinion was that they should be introduced in our public schools and colleges by virtue of their intrinsic worth. Aside from their value in the line of military training and preparedness, they are beneficial physically. There is too much of a tendency on the part of the present generation of young Americans to become "slop-shouldered" and to grow up with a carriage that is far from military. A half, or even a quarter of an hour of the manual in our schools and colleges would do much to correct this tendency. Drills with the rifle and bayonet were greatly appreciated by the volunteers. As one of them expressed it: "There is too little respect shown by the average young American for those in authority. I was greatly impressed by the respect shown by the officers in the battleships for those of higher rank and by the enlisted men for those in authority over them. This is the result of military training and we could use a large measure of it in our educational institutions to advantage. Then, there is the physical aspect to it. These military drills will go a long way toward training young Americans to be soldiers in case of war. Instead of being raw recruits, they will be well founded in the preliminary training necessary for soldiers. But if objection is made to it on the score of militarism, the physical benefits of these drills are sufficient to warrant their introduction in our schools and colleges. The manual, unquestionably, tends to developing a graceful carriage and a robust physique which are of inestimable value even in the peaceful walks of life."

With all due respect for the traditions of the service, the writer has failed to find a practical reason for the survival of the wide collar and the low cut neck in the blouses worn by enlisted men in our navy to-day. The collar came into vogue nearly a century ago, and has remained a distinctive feature of the man-of-wars-man's dress to this day. It does not add to the comfort of the wearer. On the contrary it is an inconvenience. Once the writer nearly lost his footing when climbing a ladder, through the wind blowing the collar over his eyes. A line of men standing at "attention" with a strong breeze flapping these wide collars about their heads is not suggestive of the highest form of military uniformity. It is a waste of material akin to that of the "flowing trousers" which would be excusable did it serve any kind of utility.

Also the low cut neck of the blouses seems to be another unnecessary survival of ancient times. It is a proverb that "sailors should be hardy" but modern science has shown that men can be rugged without unnecessarily exposing themselves to colds. Many severe colds were contracted by the volunteers through the sudden exposure of their throats and chests; and this was at the most favorable season of the year. What must it be when the newly enlisted man is required to bare his chest to the weather in the winter months? In many European navies the enlisted men are provided with thick flannel undershirts that come high up on the throat, thereby nearly equalizing the exposure brought about by the low cut in the neck of the blouses. But the question is naturally asked, "Why cut the blouses so low in the neck?" The volunteers all agreed that their uniforms were delightfully comfortable, allowing freedom of movement and convenience in stowing away their clothing. But would not all these advantages remain if the blouses were not cut so low about the neck? What practical advantage is there in thus suddenly exposing vital organs to the severity of the weather?

Another feature that did not fail to impress the amateur sailors in this practice cruise, was the youthfulness of the regular members of the crews and—in too many instances—their anxiety to get out of the service. Probably half of the two thousand and more volunteers were over thirty years old; and they enjoyed the cruise greatly. To many of them "Home never was like this"—in spite of the hard work and unending drills. As for the regular members of the crews more than half were under thirty years of age.

This is in striking contrast with the enlisted personnel of the British Navy where men who are making the service a life-work are in the majority rather than in the minority—and yet, the financial inducements for the enlisted man to remain in the navy are far greater in our service than in the English. What is the cause of this? One explanation may be had in that system of "home-ports" which the Admiralty has adopted in the last quarter of a century and has proved so satisfactory to the enlisted man.

By this system the greater proportion of the vessels in the Royal Navy (through an unwritten regulation) are assigned to certain "home-ports" from which they generally start out and to which they, as regularly, return on the completion of a cruise. For instance, it is well understood that certain vessels in the English Navy have Chatham as their home-port and to this port they usually return whenever a tour of duty has been completed. As a rule these vessels are in Chatham more than six months of every year and instances are frequent where war craft remain in this port ten months of the year.

By this system the enlisted men are enabled to have permanent homes. Many enlisted men in the Royal Navy own their homes in these "home-ports" and they spend more days of the year there than many landmen do with their families. One of the familiar sights in Chatham is that of a dignified bluejacket pushing a baby carriage while his wife is doing the shopping or attending to her household duties.

One indulgence in the British Navy which has worked powerfully for contentment on the part of its enlisted men, has been that of "sounding" the men when making up complements for distant service. By some means the Admiralty obtains, in advance, a very general idea of the men who desire to undertake colonial service or to serve in war craft in foreign parts; also of those who wish to remain on the home station. There are many man-of-warsmen, especially the younger and unmarried men, who are anxious to engage in distant service. A period of five to ten years in distant seas with a "chance to see the world" is a powerful attraction to them; and when we remember that boys as young as fourteen years are taken into that navy, we can readily see how they can spend ten years in foreign service and still return to "Old England" as young men, having satiated their desire for travel and can settle down on their native soil with the best years of their lives before them.

The writer well remembers his many visits to British and other European men-of-war in Yokohama, Japan, in 1878-80. While in conversation with a fine young English tar aboard the old *Iron Duke* in that Far Eastern naval rendezvous, the latter said: "Why, yes, sir. I have been on the China station going on five years now and with a turn of five years more on some other foreign station, I can return to England before I am 28 years old when I will get married, buy a little home in one of our home-ports with the money I have saved up (added to what my wife will bring me) and can look forward to a pleasant life in the navy, on home service, for the rest of my days."

To the average man, the marriage state is his best estate. It is a condition normal manhood longs for: and it is within the reach of the average British man-of-warsman. If we could introduce some system of "home-ports" and of "sounding the men" when making up crews for distant service, it would go a long way toward bringing about permanent contentment among the enlisted men in our navy.

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THE DEPARTMENTAL STRATEGIC PROBLEM AS A DRILL FOR THE ENTIRE NAVAL ESTABLISHMENT, ASHORE AND AFLOAT[1]

By Lieut. Commander Z. H. Madison, U. S. Navy

In our efforts at training for war, no more important step has ever been taken than when, in March, 1915, orders were issued which brought about the maneuvers known as the Department's Strategic Problem Number One. The system of drill launched with that initial problem, has merit and possibilities not apparent without an analysis of the obtainable results and a full knowledge of its scope and purpose.

The casual observer may see in the project merely a series of exercises—in which the department perhaps takes more than usual interest—designed to place the fleet in critical situations in the face of hostile forces. From that point of view there is certainly nothing new about the idea. We have had for several years past, at intervals, tactical and strategical maneuvers of various sorts, many of them involving a division of the fleet into opposing sides, and, if there were nothing more to the new scheme, it might be considered as simply a wise attempt to systematize and to extend somewhat the work we have already been doing. A careful study of the entire proposition, however, will make clear the fact that, if properly drawn up and continued in a progressive series, these problems will provide a means of periodically testing out and exercising all of the many agencies afloat and ashore, which, combined as a whole, make up our naval war machine. They will continually point out the weak parts in our make-up, and will insure that the necessary overhauling and alterations to those parts will be done in the light of practical experience and knowledge. In fact, the things learned and the experience gained will serve as a

[1] Written in December, 1915.—Author.

basis for calculation in all our efforts at increased efficiency, and will provide a solid foundation for our peace-time preparations.

To thoroughly appreciate the value and far-reaching effects of the new system of training, it is necessary, first of all, to consider the problems, not as exercises merely for the fleet, but as comprehensive general drills for the entire naval establishment. The idea is not merely that of dividing available vessels into opposing forces as may be necessary to work out a detached problem or to bring out some special phase of naval warfare. The opposed forces are a supposititious enemy on the one hand, and, on the other, our entire naval force and organization. The problem must, of course, present a hypothetical case, but the assumed enemy forces and the plans for their employment should conform as closely as possible to actual conditions and situations that may be foreseen as possibilities. Each problem should place us in a position that may be assumed as a probability if war should come our way, and the solution should be as real and comprehensive as we can make it. Not merely an answer to such a question as—what will this or that force do?—but a careful study by each unit of the entire establishment of the part it would take in the activities consequent to such a situation.

The general idea involved is not at all new. The notion that some such system is needed, has haunted our minds for years, and various ideas and suggestions in the right direction have been considered and, from time to time, partially adopted. But, the many interests involved have never been quite in agreement as to how the thing could best be done, and, until recently, there has been no concerted effort upon a definite scheme.

FLEET TRAINING

Regarding the matter of fleet training, that is to say, the higher training of naval forces for war efficiency, there have been in our service two schools of thought. Of those who have given the subject much consideration and who may be said to belong to one or the other group, perhaps no great number are in entire accord as to details, and, probably, very few have analyzed their views to such extent that they would care to urge them in the form of a definite statement. However, judging from arguments that have been advanced, from discussions frequently heard among officers, and from the course of events in that connection, it seems reason-

able to consider the various opinions as following two general ideas, which may be stated somewhat as follows:

One group conceives the fleet to be in the exclusive charge of the commander-in-chief, and its training a matter in which he alone has responsibility and for which he and his associates afloat should prescribe methods. The spirit of this appears from time to time in the form of jealousy on the part of the fleet of any intrusion upon its authority in the matter of programs, routine, and methods of training. Target practice rules and forms of practice, tactical maneuvers, and the like, when prescribed by the department or suggested from other sources outside the fleet, have often called forth very evident resentment.

The other group looks upon the training of the fleet to a high state of war efficiency as something beyond the possible accomplishment of any one individual. They believe that the constant readiness and ability of a large naval force to perform with accuracy and skill the many functions that will fall to it in war, require continuous effort over a long period of time; that it involves more opportunities for exercise and practice, and more time for reflection and theoretical study, than can be crowded into the régime of one commander-in-chief. In all this they see a vast field for the continuous employment of an administrative group or section close to the head of the organization whose function it would be to study and investigate the things we should know, to analyze and criticise our efforts at learning them, and to devise tactical and strategical exercises and war problems which will lead to continuous and progressive development.

It is this idea, working in the minds of those who suggest schemes for naval administration, that points to some unit with duties such as: "To study methods for the training of naval forces; to insure that the tactics of the fleet are constantly up to date and suitable to the character of ships and weapons in use, and to devise strategical problems and tactical exercises involving combined maneuvers of all types of vessels."

Among the subdivisions of the German staff will be found a section charged with duties which may be briefly stated as;—the study of tactics and higher training in the art of war, and the formulation of principles and instructions for strategical and tactical exercises and maneuvers. In fact the administrative schemes for the management of practically all navies include at

the center of the organization a unit whose duty it is to crystallize the highest tactical experience and opinion, and to make sure that such knowledge is used to the best advantage.

The following, quoted from Darrieus' "War on the Sea," indicates very decided views in this connection on the part of that writer:

> Whatever may be the ability of those who command the squadrons, it is not in accord with good preparation for war to leave to them the initiative of the method of training those naval forces. Their task of carrying out that training is sufficiently important to require their full attention. But in order that the result obtained may be beneficial, it is wholly necessary that the method of instruction be general and dictated by a superior will, the very one which bears the heavy responsibility of future war. . . . .
>
> Any other procedure is eminently bad, since it leaves to intelligences, to capacities and to temperaments which are essentially variable, since the commanders-in-chief themselves change, the care of one of the principal duties in the preparation of war. . . . .
>
> . . . . Squadrons can only be successfully trained by a methodical graduation of exercises, impossible to realize without the continuity of convictions that a central body alone possesses.

There is much to be said for either view, and arguments advanced in support of either have in them much that is true. And because that is so, it has been difficult to bring about any agreement upon a definite course of action. In official correspondence on the subject, for several years past, and in the wording of instructions and regulations regarding such matters, an ever present conflict of ideas and opinions is apparent. The resulting compromise is clearly indicated by the course our efforts at fleet maneuvers and exercises have taken.

The instructions covering the functions of the general board, following the general order of March 13, 1900, which brought that body into being, included fleet training among the subjects of which it had cognizance. The U. S. Navy Regulations, 1905, in the article setting forth the duties of the board, contained a paragraph which provided that it should consider and report upon naval operations, maneuvers, tactics, organization, and training; and the same paragraph has been included in subsequent regulations. The regulations that outlined the duties of the aid for operations prescribed that he should advise upon "all matters pertaining to operations, maneuvers (strategical and tactical) and organization of the fleet." The existing regulations definitely

charge the chief of naval operations with "the direction of all strategic and tactical matters, organization, maneuvers, target practice, drills and exercises, and of the training of the fleet for war."

The following departmental endorsement, which appeared upon a memorandum dated in January, 1913, dealing with various subjects bearing on fleet efficiency, indicates the status of the matter and the views of the department at that time:

> . . . . To provide for closer cooperation of the fleet and the Naval War College, the president of the latter has been directed to prepare problems for the summer work of the fleet; it is hoped to inaugurate a systematic and progressive series of problems of great benefit to the fleet and college, and to enable succeeding commanders-in-chief to take up the work where their predecessors left off. . . . .
>
> The earnest and cordial cooperation of the department and the fleet in establishing a more definite policy for the work of the fleet will go far towards the desired contentment and efficiency of the personnel.

These and similar letters and orders give indications of a growing sentiment in favor of a progressive system of training under the general guidance of a body specially charged with the study of methods and with devising suitable exercises. But our active efforts in such matters have not kept pace with our aims and desires. Undoubtedly, considerable progress has been made, and the recent practice of basing fleet exercises upon situations suggested by the War College has been a big step in the right direction. However, though our intentions, as they may be interpreted from regulations and orders, have been good, there has not been what can be called close cooperation and systematic effort in the matter of higher fleet training. The reluctance of those on shore, having to do with such matters, in trespassing upon what may seem to be the special province of commanders afloat, and the lack of a definite and fixed line of procedure, have resulted in spasmodic efforts, and in the lack of a progressive sequence in our work. Many maneuvers have been repeated over and over again by different régimes without a knowledge of what had gone before, and it would be difficult to find a consecutive history of such work with a summary of what has been learned, and a definite study of lines along which future exercises should be directed.

Officers with many years experience in the fleet may search their recollections and find almost nothing previous to "Strategic Problem No. 1" that can be properly designated as a compre-

hensive and finished fleet maneuver. We have had many valuable exercises, designed to bring out special features of naval warfare, such as night attacks and other exercises with destroyers, battle approach exercises, etc.; but most of the so-called maneuvers have consisted of elementary search problems or of "drill book tactics."

However, the much to be desired coordination is in sight. A happy combination of circumstances brought about an agreement among the interests involved, afloat and ashore, as to the procedure to be adopted; and the result of that agreement is a systematic course of training, of which we have seen the beginning. Constant and progressive development will certainly come from a series of such problems, each to be carefully analyzed and searched for things that may be tabulated as something learned.

THE TRAINING OF THE SHORE ESTABLISHMENT IN THE CONDUCT OF WAR

More important even than the training of the fleet, is training for the department itself, and the exercise of all parts of the establishment ashore in the handling of naval business on a war basis.

Anyone who is saturated with the conviction that success in the conduct of a war will require intelligent team work all along the line, must agree upon the necessity for some sort of periodical exercise that will involve all parts of the establishment and drill the entire organization as a war machine. The proper flow of authority, the logical allotment of functions, and an understanding as to the methods to be employed should be thoroughly thrashed out in time of peace. When war comes, each unit should be prepared to meet the new situation without strain or uncertainty, and with a knowledge of its work born of practice.

One frequently hears comment upon the danger of improper interference with the plans and operations of a commander-in-chief afloat or in the field. Undoubtedly there is danger. Upton in his "Military Policy of the United States" has presented a startling array of cases in our own wars, and history supplies abundant instances of battles lost and campaigns badly muddled because of faulty orders from the seat of government, or because of a misconception, on the part of the authorities there, of the exact situation at the scene of action.

One eminent military writer and student has said:

> Perhaps the greatest cause of failure in war has been lack of understanding and sympathy between general officers and ministers at the central government.

That is simply the author's way of calling attention to the necessity for team work. Much along the same line will be found in the works of all authorities on the conduct of war.

The fault does not lie in the fact that the authorities at headquarters are active and interested, for that is inevitable and necessary. It comes from a lack of understanding of the part that properly belongs, in carrying out plans, to the principal agents of execution, and from a want of familiarity with the handling of the business of war.

In the days when a nation's entire military power was concentrated in a single army or fleet, the king, or his favorite general or admiral, marched or sailed away with the small force available to make war against the enemy as his judgment dictated, while the government at home went on about its business. But, it is inconceivable that, with modern conditions, a war or campaign can be properly managed except under the general direction and control of a central authority and the military branches of government. In this day of cables and radio telegraphy, the seat of government is in almost constant touch with all its forces. With the high power and great steaming radius of modern war vessels, the increased mobility of armies, and the widely scattered interests of nations, the scene of action may change rapidly over great distances, and the world literally becomes a game board over which fleets and armies are moved under the general supervision of the minds in control at headquarters.

Undoubtedly there is a point where the general or admiral in command at the scene of action should be supreme, and where further supervision by higher authority would be interference and should cease; but that point will never be clearly indicated and recognized unless the military and naval establishments are trained and drilled for the work before them. It may be faulty or wise, and you may call it control or interference as you like; but, a general supervision over the forces in the field and afloat is inevitable. And such supervision will produce satisfactory results only when it comes from an administrative unit well organized and trained by practice in the preparation of plans, and

in the guidance of forces in war. Actual war practice is, fortunately, not often available, but we can have the next best thing by simulating war conditions.

Corbett, in "The Campaign of Trafalgar," has given an instructive account of the part taken by the British Admiralty in that, the greatest of all naval campaigns. A squadron on the French side of the channel was, in those ways, as much out of touch as one across the Atlantic would be to-day. But, handicapped as they were, they kept an enoromus force for months and months under close supervision, and constantly operating in accord with the aims and purposes of the government. Though usually divided into several detachments, the entire force acted as a whole upon a definite plan, and the separate elements were at all times in hand for concentration and mutual support.

Anyone who will study and analyze that campaign must agree upon the necessity for the active control exercised by the authorities in London. Yet, with it all, we see in the elasticity of Nelson's orders a clear understanding of the freedom of action essential to the commander on the spot. That there was no "restraint of the indispensable initiative," is evident from the fact, that he felt free to follow Villeneuve's squadron "to the antipodes if necessary."

Modern progress in the rapidity of communication makes all the more necessary a well understood division of authority, and a familiarity with the methods to be employed in handling the business between the fleet and the central government.

The department's strategic problems, if carried out in a comprehensive way with all agencies on a war basis, will point out defects in the machine and indicate, all along the line, opportunities for improvement in methods. Above all they will enable the various elements of the establishment to appreciate the situation with which they would be confronted if war should come.

It is not necessary to depend upon theory in urging the point. Fresh in the memory, are cases of procedure such as we have in mind with beneficial results apparent to those who were in a position to study the work involved and the effect produced. In some instances, actual changes and improvements in methods and facilities can be traced directly to things learned from, or at least brought into prominence by, a high pressure test of the administrative machinery.

When, in the spring of 1914, the fleet was ordered to Vera Cruz, the situation had in it many features that might properly be woven into a problem drawn up as an exercise, and, in the matter of communications, the business handled was a very realistic sample of what we may expect in war. The tremendous importance of an effective scheme for the control of wire and radio communication, and our need for improvement in that regard, had been recognized and pointed out by those directly interested; the Vera Cruz incident served to demonstrate our short-comings, and to lend force to their arguments.

Shortly after the arrival of the fleet in Mexico, the commander-in-chief found it necessary to urge the department to put some check on the flood of messages to ships. Such a mass of stuff was being sent through the air by the numerous offices and stations, without regard to its importance, that the fleet could not handle it properly. Also, urgent radio work from ship to ship along the shore was seriously hampered.

To meet the confused situation, a telegraph office was moved over night, and finally an order was issued causing all messages, either by cable or radio, from the department to the fleet to be forwarded from one office. There they were routed as best for the fleet; the urgent and important ones being given precedence. It was then discovered that long communications of minor importance, which might well have gone by letter, were being sent by wire or radio; two or more offices were often found to be handling and making decisions upon the same matter, and conflicting information and instructions were frequently delivered for transmission. Radio and cable routes were studied, carefully thought out schedules were adopted, and other improvements were made in minor details as found necessary to cover the emergency.

But the lasting benefit came from the steps that were taken, immediately afterward, to effect a permanent remedy. The whole matter was placed in the hands of officers, well fitted for the work, for a careful study of our present and future needs. Prompt action was taken in carrying out their recommendations, and the living result is an efficient and adequate communication system, which will stand as a monument to those who had a hand in its development.

The benefit to be derived from a periodical test of this communication system, under the pressure of simulated war conditions, will alone make the strategic maneuvers well worth while.

Another example, with beneficial results perhaps not so apparent, but nevertheless real, is that of the logistic plans and calculations that were made in connection with the contemplated movement of our own and foreign vessels to the Pacific for participation in the Panama Pacific Exposition.

Briefly, the proposition involved the rendezvous at Hampton Roads of an enormous fleet—probably much larger than we could hope to get together for a strategic problem—the supply of fuel and stores for its passage via Panama, and the maintenance at San Francisco, for a considerable period, of that force augmented by our Pacific fleet and additional foreign vessels. Eastern coal was to be used exclusively, and the matter of fuel supply presented a very real and formidable problem in logistics, which demanded an accurate and practicable solution.

For reasons that are well understood, the actual execution of the plans became unnecessary; but much valuable experience was gained from the preliminary work. Had the project been carried through, we would have learned much more, and would have accumulated a quantity of tested data for use in future similar fleet movements.

The work in that instance—and the same procedure holds in the case of fuel considerations involved in all fleet movements—was done by a group of officers in operations and in the Bureau of Supplies and Accounts, assisted by consultation and correspondence with fleet officials having to do with such matters. And just there, with that group, we have the nucleus of a logistic section, where many perplexing problems are handled with an efficiency, which does credit to those who have the matter in hand, and with a developing knowledge and capacity, apparent to anyone who has watched the work.

Now, of course, a well equipped and trained logistic section of an organization for naval administration should know all there is to be known about the availability of naval supplies, should have complete knowledge of what will be required for all adopted or contemplated strategic plans, and should be ready at all times to take up its part in the execution of such plans, not only with skill, but with confidence based on habit and thorough preparation. Its

duties, under the direction of the military head of the organization, may be summarized somewhat as follows:

(a) The consideration of all proposed strategic plans, to determine upon their practicability from a logistic point of view.

(b) To determine definitely the procedure to be followed, and to prepare in advance orders that will be necessary for the proper management of the logistic features of strategic plans that have been approved and adopted.

(c) To determine upon the quantities and places for assembly of reserve supplies of fuel and stores.

(d) The preparation and revision of complete data regarding the source, availability and transportation of naval supplies of all kinds.

(e) The organization of the fleet train and other auxiliary vessels employed in the transportation of fuel and supplies.

(f) The preparation and revision of lists of merchant vessels, their characteristics, whereabouts, and suitability for naval use. The inspection of such vessels, with decisions as to the use to which each shall be put, the alterations to be made, the time required to put each in readiness, arrangements with owners as to the price and mode of transfer, and the places of assembly.

(g) The general direction of all activities incident to meeting the logistic requirements of the fleet in peace and in war.

It is unnecessary here to discuss the importance of such work. Anyone who has had anything to do with the comparatively simple matter of fuel and supplies for the ordinary peace-time movements of the fleet, or who has struggled with the startling mass of figures in the solution of a War College program in logistics, will readily agree that a strategic plan is not more useful than a dream unless it has been prepared and tested in the light of the "inexorable logic of ways and means."

But development in such matters, without the pressure of necessity, is a slow process. If necessity required us to keep constantly on a war basis, there would be no doubt about the development of our means and facilities; but most any arrangement can be made to meet the requirements of peace, and something other than the ordinary routine is needed to force upon us a clear understanding of what will be demanded in war. As Mahan puts it, "Emergency is not always with us, though the need for an up-to-date navy is." To keep us alive and thinking on a war basis, we must periodically create an artificial emergency which will put us under the pressure of war conditions.

It may be interesting here to look into what can be done to bring the various shore stations and offices into the problems, and to investigate the possibilities in the matter of training for those

agencies in the handling of business that would fall to them in similar operations in actual war. The steps that have been taken in that connection are most satisfactory as a beginning, and it is obvious that the possibilities along that line are endless. A brief outline of the procedure that was followed in the case of Problem No. 2 will serve as an indication of the wide scope and aim of the project.

All arrangements, covering the strategic features of the maneuvers, having been made, a letter was addressed to the commander-in-chief expressing the department's desire to exercise all parts of the shore establishment under war conditions. To that end it was directed that reports from the fleet should be made exactly as would be done in actual hostile operations, covering not only the strategic features of the prospective activities, but also all constructive casualties to vessels, such as injuries to hull, battery or machinery, shortage of fuel or ammunition, or any other reports of similar nature that might aid in accomplishing the end in view. At the same time instructions were sent to all bureaus and to all yards and stations along the Atlantic coast, giving an outline of the operations at hand, and stating the department's desire that they participate in the exercise, and that they be prepared to furnish supplies and assistance, or to take any other action in connection with the management and support of such operations in the same manner as if the assumed hostilities actually existed.

Each bureau was required to have a representative on duty at all hours prepared to act on any matter falling within its cognizance, and each yard and station made the necessary arrangements to receive communications at any time and to take prompt action on any message involving activity on its part. Appropriate arrangements were made to distinguish between messages dealing with actual facts and happenings and those which were "constructive" and which dealt only with the assumed situations arising during the progress of the game. At the conclusion of the maneuvers, each bureau and station was required to submit a report upon the part it took in that connection, and in those reports comment and suggestions for future exercises were in order.

The activities brought about by such instructions can be easily imagined. The date is set for the problem to begin, and from that time every vessel, office and station in the involved area must stand by for business on a war basis. At the proper time orders

are given to "mobilize communications," which means that every link and substation in the network of the department's communication system must be on the alert at all hours for the transmission of messages with the utmost speed, directness and accuracy. In the central office of communications, located in the department and under the immediate supervision of the Operations Staff, officers and operators are on watch night and day ready to encipher or decipher and to transmit or receive messages by radio, telegraph, telephone and cable to or from the fleet or any part of the system on shore. The Operations Staff, arranged in night and day watches, keeps a log and detailed record of all operations, takes appropriate action on all reports received, and is prepared at all times to lay before the Chief of Naval Operations and the Secretary the exact situation up to the minute.

Each bureau and office in the department is on the alert for anything involving its interests, and it requires only a telephone message, a memorandum, or a copy of a message received, to put in motion whatever action may be necessary. Each yard and station is standing by for messages requiring action on its part, and upon receipt of such a message, issues orders that would be issued in an actual case.

Thus we see a readiness for prompt action all along the line. Any incident or new situation in the maneuvers, brought about by the fleet in the execution of its plans or arising from the decisions of the umpire, and involving action on the part of any agency on shore, is picked up at once and handled as it would be in an actual case.

As an example, indicating the constructive business that may fall to the lot of a navy yard, suppose, in assumed hostile operations off our Atlantic coast, the *Texas* to have been theoretically torpedoed.

The commander-in-chief informs the department as follows: "Constructive. *Texas* torpedoed. Hole 10 by 20 feet starboard between frames 10 and 15. Sending her navy yard, Norfolk, for docking. Should arrive five October. Now drawing 32 feet forward."

In the department appropriate action is taken, and the Norfolk yard is informed. The yard authorities make a study of the task before them to determine upon the procedure that will provide for the earliest possible return of the vessel to the fleet, and suit-

able orders are issued. The action taken is the same as it would be in a real case—up to the point of actually expending money and material.

Besides such things as casualties and other features involving navy yards, there are many opportunities for constructive messages to the department, to naval district commanders, etc., requesting measures which may become desirable in support of the operations of the fleet—calls for reinforcements from the reserve fleet, urgent messages requesting the dispatch of auxiliaries—from among those assumed to be loading or fitting out—to meet the fleet at designated points, calls for cooperation at given points by the coast patrol or local mine laying forces, etc. And in the case of problems involving operations in distant areas, there are many opportunities for constructive business in connection with the logistic features involved in the support of the fleet under such circumstances.

It is not only from the handling of the constructive tasks actually presented that benefit is derived. Perhaps even more beneficial is the thought and preparation involved in making ready for whatever may come. It is like drilling a ship for battle practice when it is known that constructive casualties will be introduced during the firing. The casualties, when they appear, may be few and comparatively simple; but for weeks before the practice everybody, from the captain down, sits up nights trying to foresee and to plan for any contingency.

Thus we see an opportunity to bring the entire personnel on shore, from those in the highest positions in the department down to the youngest navy yard helper, in close touch with the realities of war, and a means of stimulating thought on the part of each individual of the part he would take in actual war. And when the exercise is completed each group and subdivision will instinctively ask itself whether the tasks put before it were handled in the best possible way, whether the methods it had decided upon for situations which it suspected might arise were the best, and whether its means and facilities are adequate and well suited for any eventuality. If the answer is yes, they have well fixed in their minds a procedure into which they will fall quite naturally and calmly in any future similar case, real or assumed. If the answer is no, they will search for the reason; and the mental process will point to improvement in methods and facilities.

THE USE OF THE STRATEGIC PROBLEM AS A MEANS OF DEMONSTRATING OUR NEEDS

Another, and perhaps one of the most valuable features of the strategic problem, is its use as a means of crystallizing our own ideas upon suggested measures, and of demonstrating to the people or to Congress the need for a proposed increase or change. We often find difficulty in obtaining an appropriation to pay for, or the necessary authority to do, this or that thing for which we see, or think we see, great need. The reason frequently is that we are not quite clear in our own minds as to just what we want, and have nothing but theory on which to base our recommendations. It seldom happens that we fail to get what we want, if the merits of the proposition are apparent and we are unanimous as to the form it should take. It too often happens, however, that discussion of a new project results in an entanglement of ideas through which we, as guides, take a variety of routes; and if, at the same time, Congress, or whoever has the power to act, has no definite evidence of the need for the thing proposed, it is not at all strange if a deadlock occurs.

Such situations may be cleared up by problems designed to test out the matter. If a real need exists, it can probably be conclusively demonstrated, and at the same time our own ideas may be brought together.

An example, very much to the point, is at hand to illustrate this. Perhaps no subject, touching on the battle efficiency of the fleet, has been more constantly before us during the past few years than the want of vessels suitable for scouting and screening. Although reports and recommendations from the fleet and from the War College have consistently pointed out the need for such vessels, service opinion has been far from unanimous upon the merits of the battle-cruiser and with regard to the size and number of scouts required. The two games that have been played emphasized this feature. The situations presented have brought about a wave of conviction in the service that such types are essential to the fleet and have crystallized our ideas upon what should be recommended. As a result, it is safe to say that, now, nine out of every ten officers in the service strongly endorse the recommendation for scouts and battle-cruisers included in the building program that has been proposed to Congress—perhaps a majority would urge that as the most important part. At the same time, the difficulties under

which the blue fleet labored were apparent to Congress and to the public, and our needs in that regard are now generally appreciated. In this particular matter, the lessons of the war in Europe have mixed themselves up as additional arguments; but, without that help, the problems would have done the trick.

It is certain that a series of progressive problems will clarify our ideas on many subjects, bring into prominence many features demanding attention, and provide convincing arguments with which we may back up our recommendations for improved facilities and naval increase.

FORMULATION OF PROBLEMS AND METHODS OF EXECUTION

There is an opportunity for much study and thought upon the procedure to be followed and upon the conditions and situations to be worked into the problems. It is impossible, without previous experience, to foresee the difficulties certain to appear in the execution of such projects, and it is not to be expected that the initial attempts can be planned and carried out in the best possible way. There is no doubt, however, that a few trials will result in annual or semi-annual problems, smoothly and systematically handled, and each designed to teach some valuable lessons.

One feature, which comes to mind at once, is the use of the fleet in testing out solutions that appear sound from a game board study. Any proposed solution of a strategic problem can be tried out as a chart maneuver or on the game board, and it may be accepted as a fact that a plan or movement that seems to be unsound or impracticable from such a study will not stand the test of actual conditions at sea. The reverse, however, is not true. Many plans that, from a theoretical study, appear entirely feasible will fall down when tried out by the fleet. It is obviously a waste of time and money to use the fleet as a means of trying out a plan or solution which may be, or which has already been demonstrated as faulty by a war game study, and it would seem wise to use only solutions that have stood such a preliminary test. Any plan of action, designed to meet a given situation, which, after having been thoroughly thrashed out by the War College or by the General Board, will stand the test of trial by the fleet under conditions as nearly real as we can make them, may be accepted as a good plan.

It may not be the best, but, at least, we may be reasonably sure that it is practicable.

Above all, the conditions worked into the problems should be practical and the situations presented should be such as we suspect will confront us in war. All things artificial and any assumptions for the blue side not in accord with what we may reasonably hope for in actual war should be stringently eliminated.

With that thought in mind, it is possible to hold the opinion that the part taken by the department in guiding the activities of the blue forces should follow as closely as possible the procedure that will hold in war. To introduce an element of reality, it might be profitable to designate the War College staff, or any other suitable group of officers, as an enemy, opposed, not to our fleet alone, but in imitative war against our naval organization and power. If the matter could be handled in that way, the department and the fleet, acting in coordination, would solve the problem presented and would prepare and execute a plan as if confronted with an actual situation.

We have already mentioned the uncertainty liable to appear as to what part, in determining upon the strategic features of a plan, should be taken by the authorities in central control and what part should be left to the commander-in-chief. In war, such misunderstandings portend disaster. The strategic problems offer a propitious means of evolving a doctrine—a proper and clearly understood flow of authority.

One class of problems, in which the department's rôle in determining upon plans is clearly indicated, suggests itself at once. Plans for a campaign involving large forces, extensive areas, and long lines of communication require considerable advance preparation. Logistic considerations will limit the elasticity of such plans, and, consequently, there will be broad general features not subject to change to meet the strategic fancy of the admiral who happens to be in command, or to fit new strategic conceptions. In problems involving such considerations, it would seem wise for the department to outline the general features of the plan to be followed, as would be the case in war, leaving to the commander-in-chief the responsibility for only such decisions as should evidently be made by the one in command at the scene of hostilities.

TACTICAL PHASES OF THE PROBLEMS AND THE NEED FOR TACTICAL EXPERIENCE

The problems must, in the initial stages at least, be strategic with the opposing forces considerably separated. In no other way can the probable sequence of events and the preliminary movements and activities, beginning with information and instructions from the seat of government, be properly represented. And it may be that the big lessons will be learned from operations governed by strategic considerations. After contact is made, however, tactics will appear, and it is from the tactical lessons and the tactical experience to be gained that the bulk of the personnel of the forces will derive the greatest benefit.

In a naval engagement, the chances are that no individual taking part has had previous battle experience. The leader's greatest handicap will lie in the fact that, during a period demanding the utmost self-control and mental alertness, the entire personnel of his force will labor under the strain of new and strange sensations. Each individual, unless he has had previous experience, will suffer from the mental and nervous tension bound to be felt by an average human being when confronted by a dramatic situation with which he is not at all familiar. Compare, for example, the calm feeling of familiarity with the job at hand, on the part of Admiral Togo's battle-tried veterans, with the probable mental state of the average Russian at Tsushima. Anything that will accustom our people to the sensations and realities of war, is of immense value; and it is in the tactical phases of the maneuvers that such features will appear. We cannot simulate the terrific and destructive action of projectiles, mines, and torpedoes; but we can produce the kaleidoscopic effect of hostile forces in rapid movement, the feeling of the proximity to an enemy and the strain of constant alertness for considerable periods of time.

With regard to the tactical lessons to be learned, it may be said, without questioning the value of a widespread knowledge of strategy, that a thorough knowledge of tactics among officers generally is the thing most to be desired. During a campaign, the strategic decisions will be made by a few of the higher commanders in the fleet and by a small group of strategists at the seat of government; but problems requiring deft and sure tactical judgment may confront officers in control of even the smallest vessels.

Able tacticians are needed, not only for the proper handling of each unit, but to insure harmony and concerted effort.

When contact is first made, the forces are, in all probability, disposed over a considerable area, each taking its part in the strategic phase of the operation. Situations then change rapidly, individual control by the commander-in-chief becomes more and more difficult and the result of the clash depends largely upon the conduct of subordinate commanders. Touch with the enemy must be maintained; the various forces must be brought into position for mutual support and disposed in accordance with the plan of battle; the preliminary attacks and replies must be made; and, finally, the approach and the battle must be conducted. The task can be tersely stated. The efficient execution of the task requires genius on the part of the commander-in-chief, and more; it demands also loyal and skillful subordinates, carefully trained and indoctrinated in accordance with the tactical conceptions of their leader.

The critical period, following the stage when the opposing forces have closed to within striking distance and continuing to the final moment of battle, suggests many questions to which we have as yet no very definite answers. Notwithstanding much study and thought, there is still considerable uncertainty shrouding such matters as: the disposition and formation of forces for battle; the method of defence against night destroyer attack; the plan of battle approach; the plan for control during battle; the defence against destroyer attacks during a daylight engagement, etc.

It is in the search for information and data on such matters that we find the greatest obstacles. The situations that will arise in the phase where strategy merges into tactics, are difficult to foresee, and it is not easy to carry them along in logical sequence either as a war game study or in the case of a fleet maneuver. During that stage, an exercise being played as a chart maneuver must be transferred to the game board, and it is difficult to set down in a practical way the conditions that will govern. In the case of the fleet, the difficulty is found in bringing into use a sufficient number of vessels to produce such situations as we assume will arise. No fleet of the strength and composition that we give to the blue side in game board exercises, and that we hope to have in war, has ever been brought together for our maneuvers and

guided by a commander-in-chief through the strategical and tactical phases of a complete campaign. Even with a suitable force for our own side, it would be difficult to reproduce actual conditions without a suitable force to act the part of enemy. Constructive forces serve very well as an objective during the strategic phases; but, to produce tactical situations, actual vessels are necessary to a certain extent. Various assumed aspects of naval battles and separate tactical situations may be presented and worked out as independent exercises with comparatively small forces. But, to connect up the various phases of a campaign in their proper sequence and to indicate the influence of the different phases upon the final issue, it is desirable to throw together two forces, each complete in strength, types, and organization, and to follow through all the constantly changing situations up to and including the final battle. Such things we have never done. And it is possible to suggest many situations requiring tactical action for which we can as yet propose no plan of procedure, at least no procedure with a prestige based on exhaustive tests and successful practical application.

The want of thorough and comprehensive knowledge of up-to-date tactics is not at all peculiar to our own case. Other navies may have gone deeper into the matter, and some, we know, have brought larger forces into action in their annual maneuvers; but we have no reason to believe that their progress has been much more rapid than our own. A fair estimate of what is known of a subject may be made from what has been written about it; and, judged by such a test, tactics is a little known subject as compared, for instance, with strategy.

Here, then, lies a field for a vast amount of work and research in the fleet. Any commander-in-chief who succeeds in bringing about a universal understanding of the requirements of a naval campaign and the indoctrination necessary to insure unity of action and directness of purpose, will have had his attention sufficiently occupied without the additional burden of determining upon the broad strategical features to govern in the exercises. He must, of course, thoroughly understand the plans wherever prepared, and he must necessarily direct the strategic moves required to carry them out and to place his fleet in a position of tactical advantage; but, as a matter of fleet training, the best opportunities

for the employment of his experience and wisdom will appear after tactics becomes the controlling factor.

The best results evidently cannot be secured from the strategic problems without forces for both sides which resemble in size and composition what is probable in war. To eliminate as far as possible the necessity for constructive forces, every available naval vessel should be brought into use. In the British, German and French annual maneuvers, numerous vessels in reserve or of similar status are mobilized and given a part. Choosing at random the summer of 1910 as an example of the British practice, it is found that, for the maneuvers that year, out of a total of approximately 400 vessels taking part, 119 ships classed as " with nucleus crews " or " with skeleton crews " were increased to full complements and actively employed for several weeks. It has even been suggested that merchant vessels might be chartered to fill up gaps.

Such considerations suggest expense; but it is submitted that every dollar spent in that way will bring returns in the form of naval efficiency. Touching on the expense and other features in connection with fleet maneuvers, Vice Admiral Maltzahn, a well known German writer on naval subjects and one time director of the Imperial Naval War College at Kiel, has this to say:

> . . . . if a nation does not wish to be found unprepared when the supreme moment arrives, it must have been already directing all its efforts during peace time to accustom the personnel of its forces to the realities of war, as far as this can be done. Whilst if it is adverse to the expenditure of the money which is required for such necessary maneuvers, and if it shrinks from exposing its ships and their crews to the incidental risks which such maneuvers bring, it must expect to find that the costly apparatus for war with which its navy has been provided is of no avail.

If by " efforts to accustom the personnel to the realities of war," the author had it in mind to include all agencies of the naval establishment afloat and ashore, the quotation is a fair and concise statement of a conviction which has served as a basis for the arguments advanced in this paper.

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THE FLEET SUBMARINE

By LIEUTENANT (J. G.) F. A. DAUBIN, U. S. Navy

The modern submarine has entered upon its era of strength and accomplishment after nearly a century and a half of failure and weakness, followed by partial adoption and doubtful success. The exploits of the submarine during the present war have awakened the world to a new weapon of warfare. This warfare has had the effect of causing to be employed, by one of the belligerents, a great many vessels and men for the protection of commerce. Thus far, but few fighting units have been destroyed, the submarine has become a commerce destroyer rather than a factor against a fleet, or fighting units. To date, February, 1916, in the present war, *four hundred and eighty-seven vessels* have been reported as sunk by submarines. The outgrowth of centuries of international law must be changed to reckon with this new weapon; and for fighting ships naval architecture must devise new defenses to withstand its attack.

It is within the bounds of possibility for losses to occur to a number of slow merchantmen, or a few fast ones, when the number of sailings is great. The question arises, "Having had partial success in the destruction of enemy merchantmen, what factor or factors must be considered so that a like success may be assured against fighting ships? Is it because the submarine has been unable to remain at sea and find opportunity to strike? Or having had the opportunity did it lack the speed or other essential qualities that might have enabled it to attack, successfully, fighting ships?" What a calamity to any nation, had a large proportion of the 487 vessels destroyed been fighting ships.

Every well-balanced navy now demands its quota of submarines. The time has arrived for the United States to decide upon its submarine policy. The primary rôle of the submarine must be to destroy or aid in destroying the enemy's fighting ships; the

secondary rôle may be that of a commerce destroyer. Abroad, it would seem that the secondary rôle has become the primary, or the submarine having failed in its more important mission is doing what can be done within its capacity against commerce. In order that our future submarines may not fail in their primary mission, the feature or keynote of our policy should be the type of submarine. Once this type has been selected the energies of our constructors, engineers and submarine personnel should be exerted to perfect this powerful agent of defense and offense.

As a help in adopting the type of submarine best suited for the needs of the United States, the experience of other nations can be used, but their types cannot be accepted as our type. They have built and are building submarines to suit their geographical location and to fulfil a predetermined rôle.

If we decide that the rôle of the submarine in our future wars will be that of a commerce destroyer, a guerilla of the seas, or that it shall be used strictly as a second line of defense, then we could be assured of some success by copying the best class of the foreign submarine, the 800-ton boat, with surface speed of 15 to 17 knots, submerged speed as high as possible, and ability to remain at sea for three weeks.

But the geographical location of the United States in reference to any future enemy is unique. We have a coast line on the Atlantic from Maine to Panama, and on the Pacific from Alaska to Lower California, to defend, with the Hawaiian Islands and the Philippines to protect from seizure. The extent of our coast line has caused us to build battleships and destroyers with great cruising radii. The dreadnoughts of Norway and Sweden with their limited fuel capacity, or Great Britain's 35-knot destroyer with its limited radius, would not serve our purposes at all. Neither would the foreign submarine with its limited seagoing qualities, unless we decide to assign to this weapon the second line of defense.

A hundred submarines of the coast defense type operating from bases 50 to 300 miles to sea on the Atlantic and Pacific would afford little protection. To determine the degree of protection such a secondary line of defense would form, we must consider our fleet to have been destroyed and scattered by the enemy's fleet. His fighting forces would consist of battleships, battle cruisers, scouts, destroyers and seaplanes. He would have seized a base in

whatever ocean the fleet action took place, and it would be his next object to effect a landing at some one place. With the main fleet destroyed, the coast defense submarines on but one coast would be able to oppose his purpose. The submarine cordon lacking efficient scouts, and the vessels themselves being unable to perform this duty effectively, our country could have no knowledge of the definite intentions of the enemy. On the other hand, the weak point in this secondary line of defense would be an easy matter for the enemy's scouts to determine. Selecting a time when the weather conditions were most unsuitable for the activities of our coast defenders, the enemy's fleet, preceded by seaplanes, destroyers with nets and drags, and with his capital and troop ships surrounded by fast destroyers, would make a dash through the line. Not having advance information concerning this dash, our submarines, distant a hundred miles from the attack, would be useless. The enemy would suffer casualties, nevertheless the day would be his and he would be in position to shell our coast. Once through our line of submarines, his fleet would be protected against the remaining submarines by mines and destroyers. It would be but a matter of time until with trawlers, fast motor-boats, seaplanes, and destroyers with drags and nets, he had hunted down all of them. Perhaps before making the attack he might harass, with seaplanes and destroyers, the submarines for weeks, until our personnel and the material were completely exhausted, and then make the dash as above described. There can be no doubt that after the fleet had been destroyed, coast defense submarines could not prevent the enemy effecting a landing.

Small submarines, so often called harbor defense submarines, should be employed only for advanced base duty. They can be carried there by colliers and will constitute a defense not permitted by guns hastily mounted. The term "harbor defense," however, should not be used by naval officers. Our duty is the defense of the coast, and always must we insist on the proper units to perform, fully, this duty. Whatever protects our coasts protects our harbors. It is a well-recognized fact that no enemy can land upon our shores until our main fleet has been destroyed. Also, that the only effective way to stop him is to direct all our energies at his main fleet, whose existence is absolutely essential in order to keep his lines of communication open. If large seagoing submarines can aid our fleet in locating and defeating the enemy's main fight-

ing forces, and if our harbors and coasts will be thus better protected, then let the keynote of our submarine policy be, "The Fleet Submarine."

Submarines are weak in their ability to defend themselves. Motor-boats, mounting a one-pounder, under suitable sea conditions, may disable or destroy or drive them underwater. Trawlers constitute a grave menace, while thin-sided destroyers are able to sink or capture the submarine or defeat its attack. Submarines are a weapon of powerful offensiveness, circumstances being favorable, but unlike other classes of ships, their means of offense are not a means by which they can defend themselves. In order then that the most good may be obtained from submarines, they must be offensively employed under such circumstances that they can be protected against superior force, and this protection afforded them must not detract from the fighting abilities of the rest of our ships. This can be accomplished in but one way. Submarines must be protected by the presence of a strong fleet. The guns of the fleet, aided by destroyers, seaplanes and scouts will offset the like offensive power of the enemy's fleet. But to be able to accept this protection they must be, necessarily, fleet submarines, *i. e.*, be able to stay with the fleet.

Recent war games have pointed to the tremendous value fleet submarines would be in aiding our fleet to defend the coasts. If our scouts make contact with the enemy's scouting line and have to retire before a superior force, they can retreat and lead the enemy over a submarine zone. If our destroyers make contact with the enemy's scouts, but on account of daylight cannot go through the scouting line to obtain information or to deliver an attack upon the main body, then fleet submarines can dive under the scouting line and either obtain the desired information or deliver an attack. In case the enemy would be blockaded in a foreign harbor, fleet submarines operating submerged would be a good means of obtaining information. Suppose, for example, our main fleet to be maneuvering with the enemy's fleet for position before opening fire. The strategical and tactical value of fleet submarines in this case is almost endless. They could be used as a mobile mine field, or the enemy's fleet could be so maneuvered that the submarines could deliver an attack from the direction of his bow and thus confuse and destroy his formation, or the submarines, simply by exposing their periscopes on his bow or flank,

could force him to turn to his disadvantage. During a major action the submarines could dispose of the enemy's stragglers, or destroy his train, or his troop ships, and aid in preventing the escape of his main fleet, if scattered. Coping with our fleet submarines, the enemy's scouts, seaplanes and destroyers would be kept occupied, leaving such forces with our fleet, to a great extent, unhampered in their movements.

Fleet submarines would be equipped with long-range torpedoes. With the limited submerged speed and radius possessed by a submarine, long-range torpedoes would add greatly to the vessel's value. The enemy's column could be attacked before the submarines were observed; if acting as a mine field, the danger zone would be increased; if on the surface, the enemy would be obliged to give them a wider berth, thus giving time for the submarine to submerge if observed; if chasing a ship of superior speed, the long-range torpedo would afford the submarine a chance to strike before the enemy escaped, or before the enemy had an opportunity to ram.

Coast defense submarines are not needed any more than coast defense destroyers and battleships. Small submarines have not the speed, or if the speed, not the endurance to act continuously with the fleet. In the defense of the coast, a major action may take place a thousand miles from our shores, and two or three months after our fleet has put to sea. Small submarines require tenders or bases, whereas a fleet submarine is as independent of such as a torpedo-boat. Just as one coast defense submarine can do the work of many small submarines, so one fleet submarine can do the work of several 800-ton coast defense boats.

The possible objections that might be urged against the fleet submarine are as follows:

(a) The increased dimensions impair the handiness of the boat, and make necessary greater turning circles, both surface and submerged.

(b) Greater draft of water required.

(c) Great cost.

(d) Dangerous depths will be quickly reached due to the great length, if the boat is inclined at even a small angle, which she most necessarily will be during her lifetime. With moderate angles of inclination and only designed hull-strength it would be dangerous to operate the boat.

(e) Not so invisible, and hence not so capable of surprise.

(f) Offensive power only a very little greater, while torpedo power is not proportional to the displacement.

(g) The submerged speed is necessarily inferior to that of the principal objective, *i. e.*, the enemy's capital ships.

Objection (a). This objection could be urged equally well against dreadnoughts in favor of small battleships. If it is proven, though, that the dreadnought, or fleet submarine, has other advantages that outweigh this disadvantage, then the objection cannot stand. In the fleet submarine the handiness of the boat, or the operation of submerging, will not be any more difficult than in a small submarine. The smaller the submarine—the less length she has—the greater are the angles required to dive or porpoise. Our latest boats, the *L*-class, can submerge practically on an even keel, and the crew can move about considerably without affecting the trim, while in the *C*-class, several degrees are required to submerge, and the movement of one man often affects the trim. The fleet submarine will handle readily while submerged, and be very stable. Compared to smaller boats, it will be much safer under water, as it will be able to submerge with several tons of positive buoyancy. Small leaks will not give it negative buoyancy, and in case of accidents to the motors, or to the steering gear, having positive buoyancy, it can readily be brought to the surface.

Objection (b). When it is considered that a submarine cannot operate successfully in water less than eight fathoms, the difference of a foot or two in the dimensions does not matter.

Objection (c). If it is proven that the fleet submarine is best for the country's defense it is a waste of money to build smaller boats. At any rate the question of cost is not the province of the naval officer. He should select the best and let Congress decide upon the dollars and cents.

Objection (d). The fleet submarine would not require such excessive angles of inclination that the bow would be at a dangerous depth. The longer the boat, the less it has to be inclined to submerge; the long superstructure deck acts as a rudder and so assists in diving. On the fleet submarine there could be also at least two sets of hydroplanes, which would obviate any necessity for dangerous inclinations.

Objection (e). The question arises, how much? The writer does not know. Does anyone know? The conning tower of a

fleet submarine would not have to be any larger than that of an 800-ton vessel. The free-board would not necessarily be higher, and she could submerge practically as quickly as any other boat. Objection (e) is, therefore, an open question, but in any case will not exist to a degree which will outweigh the advantages of the fleet type.

Objection (f). In future fleet submarines broadside hull-tubes can be placed. Such tubes will add greatly to the offensive power. The submarine will not have to be pointed at all times before firing. In the battery compartment of the fleet submarine at least six additional torpedoes could be carried, as the crew would not require all the large space for living purposes. A fleet submarine could carry mines, a very great addition to her offensive qualities. She would be equipped also with long-range torpedoes. This torpedo would be fired from the surface, at night or in day time, from superstructure tubes. Since the fleet submarine can carry more torpedoes in proportion to her tonnage, and since broadside hull-tubes, superstructure tubes for long-range torpedoes, and mine-laying apparatus can be added, the fleet submarine has more offensive power in proportion to tonnage than a small submarine. No comparison is made of the guns that would be mounted, but the defensive power would be proportional to her tonnage since she could carry more small caliber guns, or the same number of a larger caliber gun.

Objection (g). This is true of all submarines. With the storage battery as the source of power for underwater propulsion, the submerged speed can never equal that of the enemy's capital ships.

Some of the advantages of the fleet submarine have been discussed. Briefly they are as follows:

(a) Increases the fighting efficiency of the fleet, thus affording our coasts and harbors better protection.

(b) Are better protected themselves against the enemy by our own forces than are coast defense submarines acting independently of the fleet.

(c) Greater offensive power since they carry more torpedoes, and long-range torpedoes.

(d) Ton for ton they require a smaller personnel, a great advantage in war time when the personnel for submarines will have to be conserved.

(e) More habitable, thus increasing the morale of the personnel.

(f) Could keep the sea in any weather.

(g) Could have radio plant of greater power than coast defense submarines.

(h) On account of seagoing qualities, could remain at sea with the fleet and could replenish fuel and torpedo supply from the fleet train.

(i) Would be under the direct command of the commander-in-chief, as the torpedo flotilla is, and thus their offensive power would be coordinated with that of the fleet.

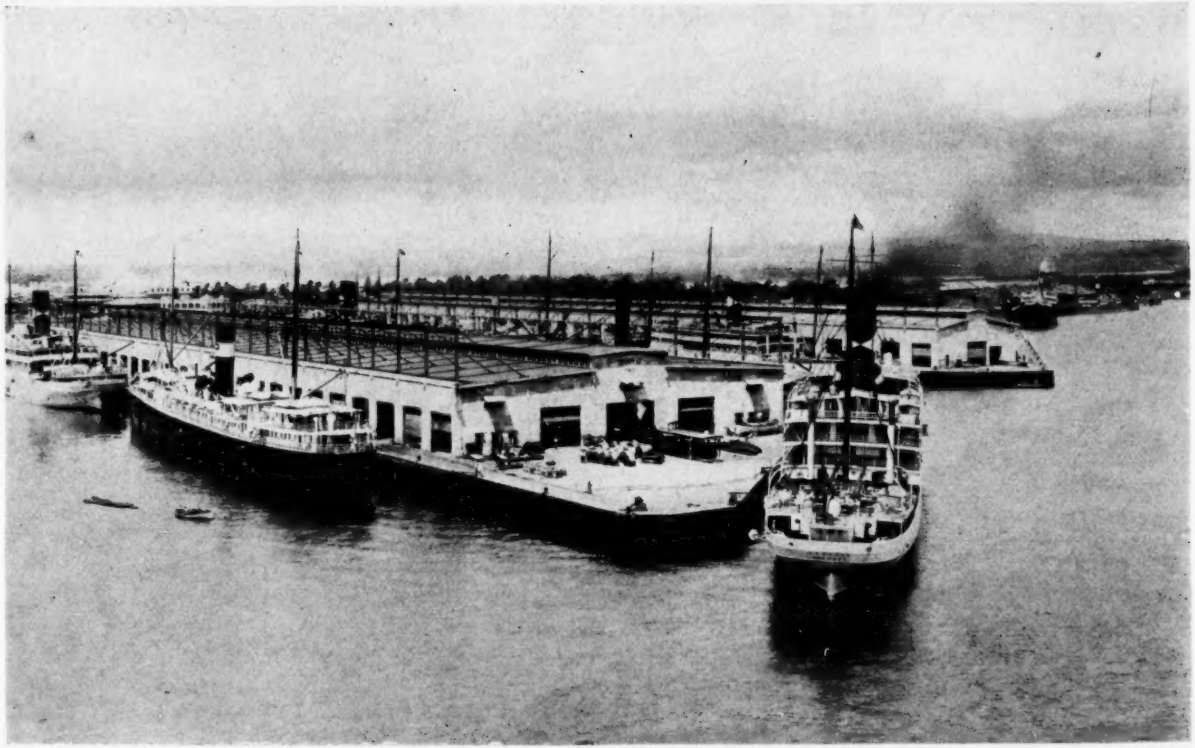
The one great disadvantage of the fleet submarine is that we have none at present in commission. Some authorities claim that they are experimental. There is but one quality of the fleet submarine experimental, and that is her speed. The contractors are confident that they can build fleet submarines to make 20 knots. Even if the contractors fail on their first attempts, and the submarines make but 19 knots, they will be preferable to 800-ton coast defense submarines of 16 knots speed. Moreover, the experience gained will be very valuable for future designs. Fleet submarines making from 18 to 20 knots can operate with our capital ships having a full speed of 21 knots, as 15 knots is a high figure for average fleet cruising speed in war or peace. It must be remembered that the Deisel engine is but in its infancy. There is every indication of its perfection, and with perfection will come reliability. Our endeavor should be to obtain as high a surface speed as possible consistent with submerged speed of at least 14 knots, and a submerged radius of 30 hours at a lower speed. To obtain surface speed higher than 20 knots, steam propulsion, probably, must be used for fleet submarines. Many problems are encountered here, but none that cannot be overcome. A submarine with high surface speed will have more time to submerge. Surface speed will add to her defensive qualities as well as to her offensive qualities. The increase in the submerged speed and radius will make them a factor to be considered by the enemy. Great Britain gained a big ascendency over the rest of Europe by being the first to build dreadnoughts. Why should not the United States gain a few years over any future enemy by being the first to build fleet submarines?

Another disadvantage urged against the fleet submarine by some, is the length of time required to build them. It is true that

any departure in naval architecture requires time. If, however, Congress would recognize the many advantages of fleet submarines, and if it is considered that we need them quickly, they could be built in 20 months time, and the rest, if duplicates of the first, in less than 14 month's time.

As regards the number of fleet submarines required, no attempt will be made to specify, as such is beyond the limits of this article. Thirty fleet submarines to act with the Atlantic fleet and ten to act with the Pacific fleet, could be built for about $50,000,000. This is less than is required to build seventy 800-ton submarines and equip the various bases needed. Even ten fleet submarines would greatly increase the effectiveness of our fleet.

In conclusion, critics of submarines must remember that no fleet action has taken place abroad in which these vessels have taken part; that should a major action take place, there will be no fleet submarines to take part, and, therefore, any failure of the European boats in fleet action cannot be urged against the proposed fleet submarine for our navy.



CRISTOBAL TERMINALS, GENERAL VIEW OF PIERS NOS. 8, 9, 10 AND 11

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TERMINAL FACILITIES OF THE PANAMA CANAL

By Civil Engineer H. H. Rousseau, U. S. Navy

The terminal facilities of the Panama Canal, which have been authorized as a part of canal construction work, are costing about $32,000,000, toward which the Panama Canal furnishes about five-sixths of the funds from Congressional appropriations, and the Panama Railroad one-sixth out of its surplus revenues. This work was practically completed by June, 1916.

Terminal work includes:

First: The breakwaters and harbor dredging, authorized by the "Spooner Act" of June 28, 1902, which provides for the construction of "safe and commodious harbors at the termini" of the canal; and

Second: The necessary conveniences for vessels using the canal and terminal harbors, such as docks, piers and other water front improvements, dry docks, repair shops, cranes, storehouses, fuel plants, etc., which are being provided in accordance with the Panama Canal Act of August 24, 1912, which authorizes the President "to establish, maintain and operate, through the Panama Railroad Company, or otherwise, dry docks, repair shops, yards, docks, wharves, warehouses, storehouses and other necessary facilities and appurtenances for the purpose of providing coal and other materials, repairs and supplies for vessels of the Government of the United States, and incidentally for supplying such at reasonable prices to passing vessels."

The canal and terminal works have been so planned and constructed as to keep within the cost limit of $375,200,900 fixed by Congress, in accordance with the Isthmian Canal Commission's estimate of December, 1908. This estimate included under terminals only amounts for breakwaters in Limon Bay, and for loans to the Panama Railroad with which the latter could construct a coaling plant and some permanent docks and piers at Cristobal.

Cristobal Terminals, General View of Piers Nos. 8, 9, 10 and 11

Other terminal requirements did not develop and were not given consideration until after 1908. Over one-third of the Panama Canal's share of the cost of terminal facilities has been derived from savings resulting from construction work costing less than as estimated in 1908, and from the item " for contingencies " in the estimate of 1908.

About two-thirds of the terminal work has been designed and constructed under the supervision of the writer as Engineer of Terminal Construction, reporting to the Governor of the Panama Canal. The balance was largely performed before the Division of Terminal Construction was established. Civil Engineer F. H. Cooke, U. S. N., performed important services on the Isthmus in connection with the design of the dry docks, coaling plants, floating cranes, and of other terminal projects.

GENERAL

During the 30 years between 1851, when the Panama Railroad began operating between Colon and Gatun, and 1881, when the French started work on the Isthmus, no harbor improvements were undertaken in Limon Bay other than the construction by the railroad company and by two steamship companies of a few wooden piers, although the Atlantic coast was subject to periodic storms called " Northers," which caused great damage in the unprotected bay. Between 1857 and 1879 seven severe " Northers " occurred that wrecked 29 vessels and destroyed or damaged the piers. American naval officers who were delegates to the International Congress in Paris in 1879, recommended the construction of a breakwater at Colon, extending out from Manzanillo Point, to improve these conditions. The construction of such a breakwater, 1000 meters long, was approved in 1881, but before it was undertaken the French transferred all of their activities from the Colon water-front to the mouth of the proposed canal at Cristobal Point, and secured the required protection for their construction plant, as well as for the canal entrance, by building a mole on which they afterwards constructed the present town of Cristobal. The French intended that their permanent wharves and piers, coaling plant, dry docks and shop facilities, should be located along the north side of the canal between Cristobal and Mount Hope, with an inner harbor or basin just inside of Cristobal Point.

On the Atlantic side, the average tidal range is 11 inches, and the extreme range 2 feet 8 inches. On the Pacific side the average tidal range is 12.3 feet and the extreme range 21.8 feet. Freedom from storms on the Pacific side renders the protection of the anchorage ground and canal entrance by breakwaters unnecessary.

On the Pacific side the French plans for a sea level canal included an inner dredged basin stretching southward from Corozal towards Sosa Hill, to be called " Panama Harbor." The adoption of plans for a lock canal in 1887, owing to lack of funds to complete the sea level canal, and the completion in 1888 of the canal channel to a depth of nine meters from old La Boca to the sea, led to the determination to establish terminal piers at La Boca, and to abandon the transfer of freight and passengers on the Pacific side by lighters that tied up during high tide at the old wooden railroad piers in Panama City. The failure of the old French canal company in 1889 delayed any action being taken on this plan until after the new French canal company was organized in 1894. The result of negotiations started in 1895 between the new canal company and the railroad company led to the construction of the old La Boca steel pier, which is still in useful service, and which, together with a turning basin and accessories, including an embankment, railroad yards, etc., cost the Panama Railroad $2,188,000, and was known as La Boca Terminal. It was completed in 1898.

When the United States took control on the Isthmus in May, 1904, one of the most pressing necessities was additional wharves and piers for receiving and handling the large quantities of materials and supplies needed for construction purposes. The Panama Railroad treasury was empty, so the Isthmian Canal Commission had to spend over half a million dollars for temporary docks and for dredging at the terminals. Most of these docks were afterwards leased to the Panama Railroad. On June 29, 1906, Congress approved a lock canal of the general type proposed by the minority report dated January 10, 1906, of the Board of Consulting Engineers, that had been appointed by the President. This report recommended harbor protection at the Atlantic Terminal along the lines originally proposed by the French, that is, by means of a breakwater extending out from Colon beach near Manzanillo Point. A west breakwater paralleling the canal through Limon Bay was also proposed. An alternative suggestion was to omit this latter breakwater and double the proposed

canal width to 1000 feet. This would have afforded a protected harbor larger than that obtained by the French plan, but much smaller than that which has been obtained under the plans which were afterwards adopted. The Board recommended the completion of the inner harbor south of Cristobal Point that was originally proposed by the French for wharves, coaling facilities, etc. At the Pacific end the minority report of the Consulting Board included provision for a set of two-lift locks to be located on the west slope of Sosa Hill. No special harbor protection was considered necessary, and no recommendations were made for terminal piers and other facilities.

For three years after the adoption of the lock canal project, all efforts were concentrated on canal construction work, and while the necessities for permanent terminals were gradually developing, and ideas in regard to this work were slowly crystallizing, no definite action was taken until the latter part of 1909, when the appointment of a joint Army and Navy Board on Fortifications and the increasing requirements for additional wharf room assisted in bringing matters to a head.

In 1907 it had been decided at the Capitol in Washington that any appropriations for the defence of the canal would be included among the appropriations made for the War Department, and that the fortifications would be constructed by the War Department; with the understanding that no estimates would be submitted until efforts to secure the ratification of the necessary treaties that would insure the neutrality of the canal had been abandoned. The duties assigned to the Panama Canal Fortification Board included matters connected with the availability of land that might be required for naval purposes. The naval members of the Board were also required to obtain information of use in connection with the establishment of naval repair stations.

A tentative selection of sites for dry docks, repair facilities including storehouses, fueling plants, wharves, and other naval utilities, was made at Mindi on the Atlantic side, and at Diablo, between Corozal and Balboa, at the Pacific end. These locations were not the most desirable or economical, as the Board was restricted in its choice to land not reserved for canal use. The Isthmian Canal Commission expected that there would be also required for canal and commercial use, a permanent repair plant and dry dock, fueling plants, storehouses and wharves and piers,

and considered that a duplication, solely for military use, of these utilities, that would have to be provided for the canal in any case, would be undesirable and unnecessary. At a meeting held in April, 1910, it passed the following resolution:

"That economy in the administration of the Panama Canal, both before and after completion, requires adherence to the principle that such facilities, appurtenances, etc., as may be required for its construction, sanitation, operation, maintenance, repair, defence, and commercial use, and by the Panama Railroad Company and by the Canal Zone Government, shall be combined and consolidated, so far as practicable, without duplication, regardless of their use by more than one executive department of the government."

Subsequent conferences between representatives of the navy and the canal led to the formulation and adoption in November, 1910, with the approval of Washington, of a policy that was designed to give satisfactory service to all departments and interests concerned with the least expenditure of money. This policy, which is still in effect, gives the navy satisfactory control and supervision over the facilities in which it is especially interested, by the examination and approval in Washington of general plans before work is started, and by detailing naval officers as its representatives for duty under the Governor of the Panama Canal on the Isthmus, in connection with design, construction and operation, of naval facilities. The comparatively small repair plant and dry dock at Mount Hope that has served the needs during the construction period will be maintained as long as required, and the construction of a large modern plant, similar to that at Balboa, will await the development of future requirements. Requirements solely for naval purposes are to be paid for from naval appropriations; facilities provided to meet canal and commercial needs are paid from canal appropriations.

The Panama Canal has proceeded with the design and construction of its terminal facilities in accordance with the above procedure. In July, 1910, the first steps were taken to increase the berthing space at each end of the canal by the construction of permanent wharves and piers. Congress had not yet authorized any expenditures of this nature in connection with the canal. Therefore, this work had to be undertaken at the expense of the Panama Railroad Company. At Balboa, the first section of permanent wharf, 650 feet in length, forming a part of present Dock No. 15, was authorized in September, 1910, and completed by the

Panama Canal for the Panama Railroad in July, 1912. The passing by Congress of the Panama Canal Act of August 24, 1912, permitted subsequent terminal work to be undertaken and paid for by the Panama Canal.

On the Atlantic side, the Panama Railroad at first favored locating the permanent docks along the south side of Cristobal Point adjacent to the entrance of the French canal, where the French intended to locate their docks. On account of the inadequate room for railroad yards and the unsuitable character of the bottom, further consideration led to the abandonment of this plan and resulted in locating, in the latter part of 1910, the permanent docks and piers, in the Canal Zone, behind a mole constructed out into Limon Bay from Cristobal, which plan has since been followed.

At the Pacific end, it was first planned, in 1910, to dredge an inner basin behind Sosa Hill, with the wharves and piers for commercial use along the south side; and the repair plant, dry docks, and other naval facilities grouped along the north side at Diablo Hill. Considerations of economy and the policy of consolidation which was adopted in November, 1910, resulted in the abandonment of this plan, and the adoption, in May, 1911, of a project which combined the results of both individual investigation and committee reports. This plan retained the feature of an inner basin, and grouped the dry docks and repair plant along its south side under Sosa Hill, with the commercial wharves adjacent thereto, and a system of five commercial piers at the head or east end of the basin, and jutting out into it at right angles to the canal. This plan has since been followed. Both the general plan of the terminals, as well as the general plans of the various units, including shops, fueling plants, dry docks, etc., were submitted to the Navy Department for review and recommendation before starting work.

The following is a general description of some of the terminal works:

THE ATLANTIC BREAKWATERS

Harbor protection in the form of breakwater construction at the Atlantic terminal includes the West Breakwater, the East Breakwater, and Cristobal Mole. The West Breakwater was authorized in 1910 and completed in May, 1914. It extends from Toro Point Light in a northeasterly direction in a straight length of about

11,378 feet to within 1000 feet of the center line of the canal, which has a channel width of 500 feet. At its outer end the depth of water is 44 feet and there is a small ell or return 223 feet long, behind which has been placed the breakwater light. The anchorage ground, bounded by the West Breakwater, the canal channel, and the 30-foot contour, has an area of about three square miles, and that bounded by the breakwater, the canal channel, and the 36-foot contour, has an area of about one and one-half square miles. This breakwater consists of "core rock" carried up to within about 12 feet of the surface, on which was placed larger rock termed "armor rock," to a height of ten feet about sea level. This breakwater cost about $3,500,000 or $300 per running foot. It contains about 2,000,000 cubic yards of material.

Cristobal Mole will be, when completed, about 4000 feet long. It extends out into the bay from Cristobal at right angles to the canal channel. It is being extended from time to time as required to protect the piers which are being constructed on the south side of the mole. Two of the five piers, Nos. 7 and 8, for which there is room, have been constructed, and work on a third pier, No. 6, for which an appropriation has just become available, has started. The present length of the mole is 3000 feet. It consists largely of rock fill armored on its north side. It has cost approximately $500,000. When it was authorized in 1910, it was thought that the furnishing of this protection to shipping lying south of the mole at the permanent docks and piers would render the construction of the East Breakwater unnecessary. Experience led to strong recommendations being made for the Isthmian Canal Commission to consider favorably the construction of the East Breakwater, and in view of the added safety that would be secured for the Atlantic terminal harbor through its construction, and of the estimated lessened cost of maintaining the channel through the soft mud of Limon Bay, its construction was finally authorized in 1913. The East Breakwater is a "detached" breakwater with its outer end opposite the outer end of the West Breakwater. There is an opening of 2000 feet between the breakwaters. The breakwater has a 225-foot ell at the outer end. It extends shoreward a distance of 6516 feet, making a total length of 6741 feet. Its inner end is 4467 feet from the shore at Coco Solo Point. The breakwater has not been continued to the shore, as this additional length would be of little or no value as regards increased canal and

harbor protection. The breakwater has been built mainly of rock, and is similar in cross section to the West Breakwater. Above the surface of the water and down to elevation-12, concrete blocks have been largely used in lieu of "armor" rock. The concrete cubes were manufactured in various sizes from 4′ 3″ on a side, weighing 5½ tons, to 7′ on a side, weighing 25 tons. The quantities in the completed breakwater, costing about $3,300,000, include the following:

	Cubic Yards
"Core" rock	682,000
Hydraulic and scow fill	650,000
"Armor" rock	68,000
Concrete blocks	200,000

The construction was rendered more hazardous and expensive by the necessity of maintaining the unfilled wooden trestle nearly a mile in length, connecting the breakwater with the shore at Coco Solo Point, over which the rock fill was transported. Two unusually severe "Northers" visited Limon Bay during the construction period, one in February, and one in April, 1915. These "Northers" destroyed nearly all of the construction trestle, delayed the completion of the breakwater six months, and caused damage to the extent of nearly $400,000 in connection with the breakwater. The trestle was promptly redriven and the dumping of rock was resumed in the latter part of July, 1915. The rock fill was quarried at Sosa Hill on the Pacific side, and was transported 50 miles across the isthmus and dumped in place for $1.01 per yard, including all costs except that for trestle construction.

During 1914 some small dikes were built out from the south shore of Limon Bay close to the canal channel to assist in retarding the movement of silt which the wave action on the muddy shores resulted in depositing in the channel. Prior to 1915 severe "Northers" always caused a large amount of soft mud to be deposited in the canal channel. The two "Northers" of 1915 increased the maintenance work in the canal channel by less than 60,000 yards. The reduction can be attributed in some small part to the effect of both the West Breakwater and the Cristobal Mole, but it is probably more largely due to the above-mentioned dikes and to the present flatter slopes of the sides of the dredged channel at the upper end of the bay.

The anchorage ground bounded by the East Breakwater and the 30-foot contour, and included between north and south lines

passing by the outer end and by the inner end of the breakwater, has an area of 1.5 square miles. The area of the anchorage ground included between the breakwater and the 36-foot contour, is one square mile.

THE PACIFIC BREAKWATER

At the Pacific Terminal, the removal of the double-lift locks inland from Sosa Hill to Miraflores, which was approved in 1907, and the straightening of the channel so as to pass to the west of Naos Island, in connection with finding a convenient place to dispose of soil excavated from the south half of Gaillard Cut, opened the way for the approval in 1908 of a project to connect Naos Island with the mainland by a dike or breakwater, which was completed in September, 1914, at a cost of about $800,000. This cost includes only the cost of the trestle and the excess cost of dumping the material over what it would have cost if disposed of in the cheapest manner. The principal value of this breakwater, which has a length from Naos Island to the original shore of about 3.3 miles, is the protection it affords to the dredged channel as regards deterioration, caused by silt bearing tidal currents that would otherwise sweep from the northeast to the southwest across the channel. Balboa dump, which has been made from spoil from Gaillard Cut by widening the inner half of the breakwater, has furnished a site for a radio station, a quarantine station, a fuel oil plant and tank farms, and has served other useful purposes in connection with the Pacific terminals. For its outer 6500 feet, the breakwater has a width of 40 feet, with its top about 18 feet above sea level. A highway and a railroad track have been built on the breakwater.

THE PACIFIC TERMINAL PLANT

The Pacific terminal plant has been designed with a view to meeting the combined canal, railroad, naval, military and commercial requirements. It has been located at old La Boca, now renamed and called Balboa. It consists of the following principal units:

(A) Two dry docks.

(B) Repair shops including storehouses, storage yards, tracks, and other accessories.

(C) Fueling plants, including both coal and oil.

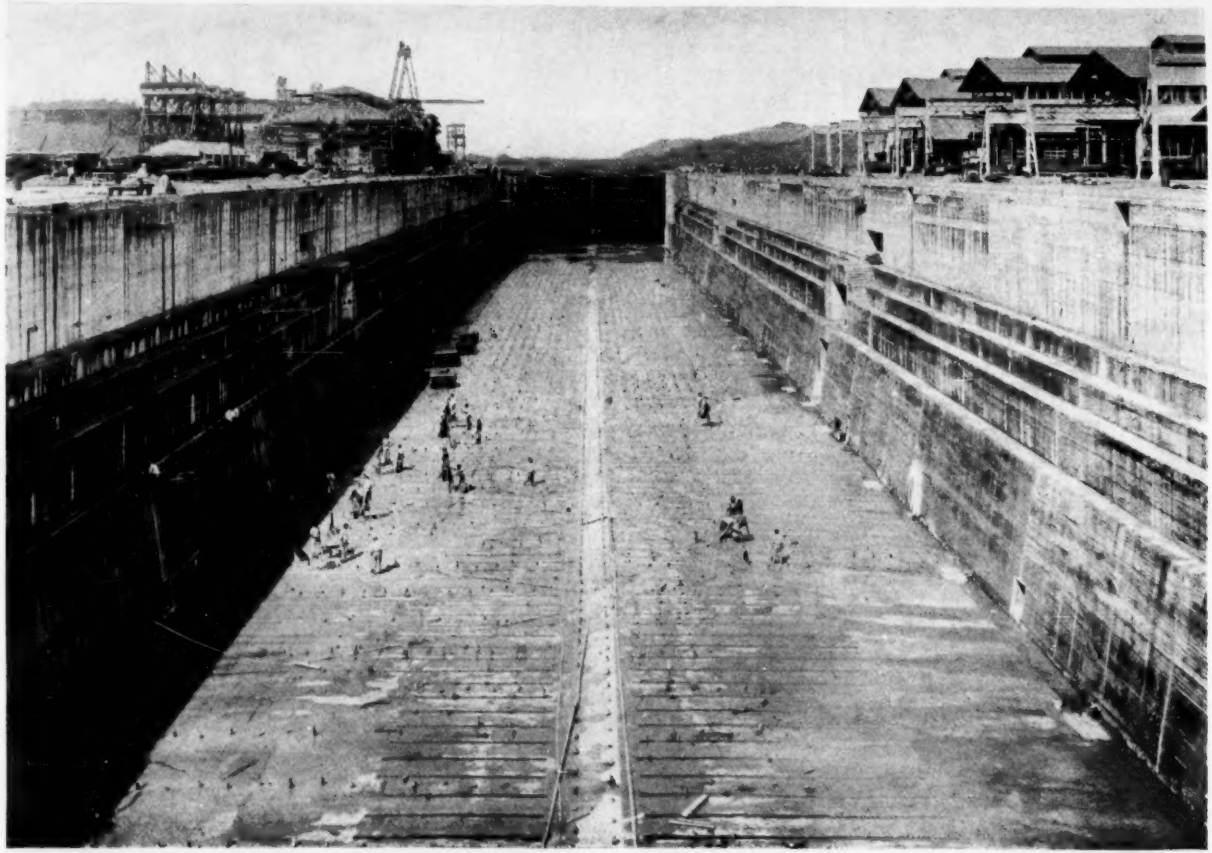
(D) Wharves and piers for canal, naval and commercial use, including berths for vessels under repair.

Dry Docks.—There will be two dry docks; No. 1, of sufficient size to dock any vessel that can pass through the canal locks; and No. 2, which will be of smaller dimensions. The layout of the repair plant at Balboa was determined and worked out after first fixing the location of Dry Dock No. 1, where it could be built on rock.

The principal dimensions of Dry Dock No. 1 are:

	Feet
Width at entrance	110
Width in body on floor	113
Width in body at coping	143
Length on center line, from miter sill to head	1044
Length on center line, from head to caisson sill	1102.67
Elevation of top of blocks referred to mean sea level	—35.0
Elevation of miter and caisson sills referred to mean sea level	—39.5
Elevation of coping referred to mean sea level	+16.5

The dock is built on rock and is composed of about 185,000 cubic yards of plain and reinforced concrete, the greater part being plain or mass concrete. The floor consists in general of a 12-inch concrete lining placed directly on the rock. Where pockets of fractured or partially decomposed rock were met the thickness of the floor was increased. The side walls of the dock are gravity retaining walls. At the bottom of each wall is a large culvert. Each culvert has 17 grated openings leading to the floor of the dock, equally spaced longitudinally. These distribute the water in flooding the dock, and reduce longitudinal currents; and in the last stages of pumping out the dock these openings assist in the rapid unwatering of the floor of the dock. The dock has side altars of heights adapted to navy requirements, all altars being 3 feet wide. At the coping level the dock is equipped with a 5-foot gauge railroad track and a 22-foot gauge 50-ton locomotive crane track. Air and fresh water conduits are carried down to the floor of the dock in the side walls at frequent intervals. The dock has been equipped with four stairways on each side and two material slides. The center keel blocks are of cast-iron of the wedge type, with a white oak top block, and have a total height of 4 feet 5 inches. The docking keel blocks and the sliding bilge blocks are of standard navy type of greenheart and white oak with galvanized metal fittings. The entrance to the dock is closed by a pair of steel miter gates electrically operated of a type similar to the miter lock gates, except that the dry dock has granite sills and hollow quoins in lieu of wooden and steel sills and nickel steel bearing plates for the hollow quoins on the lock gates. The miter and quoin ends and clapping sill of the dock leaves are of greenheart. All exposed metal work of the gates has been protected by bitumastic enamel. The greenheart is immune to attacks of teredo.



General View of Dry Dock No. 1, Balboa, from Coping Elevation at Head, Looking Towards Entrance. Taken in 1916

The gates can be completely opened or closed in less than two minutes. An outer sill of granite has also been provided in which can be placed the floating caisson, which has been provided for use in making repairs at the canal locks. This caisson has its own pumping plant, and can be used to give access to the outside of the dock gates for cleaning and repairs. The dry dock is equipped with cast-iron bollards spaced 55.5 feet apart along the side walls and set 40 feet back of the coping, and with nine electrically-driven capstans capable of developing a rope pull of 35,000 pounds at a speed of 30 feet per minute. The dock is fitted with the accessories usual with naval docks. The pumping plant for both Dry Dock No. 1 and No. 2 is located on the south side of Dry Dock No. 1, near the entrance. It consists of four main pumps, two drainage pumps and one bilge pump. Each main pump is a single bottom suction, vertical shaft, volute centrifugal pump of 54 inches discharge diameter. The average rated contract capacity of each pump is 11,000 cubic feet per minute. Each pump is driven by a 1000 horse-power, 3-phase, 2200-volt induction motor, located at the ground level vertically above the pumps. The valves controlling the operation of the pumps, as well as the main culvert valves, are operated hydraulically at 300 pounds pressure. The dock has been designed to be unwatered in about two and one-half hours, and can be flooded in less than 30 minutes. During the acceptance tests of the pumps and valves these times were considerably bettered. In the pump-house, which is 59′ 10″ x 255′, there has been installed in addition to the pumps, the main air compressor plant for the shops, consisting of one 2250 and one 5500 cubic foot motor-driven compressor.

All work in connection with the construction of the dock, including the installation of the pumping plant and the erection of the dock gates, has been performed by the forces of the Panama Canal. The dock will cost, complete, about $2,700,000.

The body of the dock and the entrance gates were ready for use on April 1, 1916, though the blocking system and a number of accessories had not been installed due to the non-delivery of material.

The final shot for breaking a gap through the cofferdam which has protected the entrance basin, the dry docks, coaling plant and adjacent quay wall work during the construction period, was made, and the entrance basin and dry dock were completely flooded on April 23, 1916, after which the gates were closed, and the dock was unwatered by a portable pumping plant, the installation of the permanent pumping plant not having been entirely completed. After April, the use of the dock was contingent upon the removal of the cofferdam. The dock has been used as required since July, 1916.

A smaller dry dock, No. 2, has been located parallel to Dry Dock No. 1, and immediately northwest of the entrance thereto. This dock will have the following dimensions:

	Feet
Width at entrance for full height	72
Width in body at floor	75
Width in body at coping	92
Elevation of sill and floor, referred to mean sea level	—22.83
Elevation of top of blocks, referred to mean sea level	—18.33
Length on floor from caisson sill to head wall	366
Overall length on floor from outside of masonry to head wall	381

This dock will be rectangular in plan with side and head walls of concrete. The floor will be concrete, about one foot thick, laid on rock. The dock will be provided with a floating caisson which will bear on a granite faced seat. The dock will have stairs on each side at the entrance and head, with a material slide alongside the stairways at the head. The dock will be equipped with the necessary capstans and bollards, and will be served by the same pumping plant as Dry Dock No. 1. The excavation for this dock has been completed and the concrete for the south side-wall and the head wall has been laid. The south side-wall forms a part of the north guide wall or entrance pier to Dry Dock No. 1.

After Dry Dock No. 2 had been planned, and funds had been allotted for its construction, some doubts were expressed by Members of Congress while on the Isthmus as to the advisability and necessity of proceeding with the work until Dry Dock No. 1 was unable to handle the volume of business offered. This led to the adoption of the program which has been followed since 1914, of completing Dry Dock No. 2 only so far as necessary for the convenient operation of Dry Dock No. 1, and of awaiting actual experience as to the amount of work there will be for Dry Dock No. 1, and specific authority from Congress before going further. To complete Dry Dock No. 2, and remove the material at its entrance, will cost approximately $400,000.

BALBOA SHOPS

The permanent repair shops are intended to meet all the varied requirements incident to the canal, the navy, the army, the Panama Railroad, the Panama government and citizens of Panama, and of commercial shipping. The main buildings are located in an area 635.5 feet wide measured between Dry Dock No. 1 and the sea wall parallel thereto and 2500 feet long. The main metal working

shops, including machine shop, boiler shop, pipe shop, blacksmith shop and storehouse for metal, are 360 feet in length and are placed at right angles to the dry dock, and provided with overhead traveling cranes with runways extending beyond the ends of these buildings, so as to span two railroad tracks which pass by each end of these buildings. These tracks, together with a track passing across the center of each of these buildings, afford economical facilities for receiving and shipping material and equipment. The remainder of the shops, including the wood-working shops, storehouses, foundry, car shops, paint shop, etc., are located further to the east, and are parallel to the water front. A 3-story office building is located close to the center of the shop yard and adjacent to the water front.

The buildings all have steel frames. The main shops are surrounded by a concrete curtain wall 3 feet 6 inches high, above which the sides are closed in by galvanized steel louvers, which, being easily adjustable, afford ample ventilation and protection against sun or rain, and can also be easily closed at night. The main door openings are closed by steel rolling doors. California red-wood has been used for mill work, including window sash, smaller doors, monitor louvers, etc. Creosoted wooden blocks laid on a concrete base have been used on the floors where concrete, cinder, clay, or earth floors are not suitable. For the roofing, reinforced concrete red "Bonanza" tile, manufactured on the isthmus, was used with special tile set with skylight glass wherever additional light was needed.

The shops are electrically operated, the current used being 3-phase, 25-cycle, delivered from the Balboa substation at 2200-volts, and stepped down to 220-volts for the shop power circuits. Switchboards and transformers are located near the load centers of groups of buildings. Induction motors are used for group drive and for all constant speed machines; 220-volt direct current motors are used where variable tool speed is desired. The total rated horse-power of motors is about 5000.

The buildings have been liberally supplied with overhead electric traveling cranes up to 60-ton capacity, and also with the necessary equipment of jib and pillar cranes. For night work the shop buildings have been thoroughly lighted, avoiding the use of portable lamps and securing high efficiency for night operation. All lighting circuits are single phase, 110-220 volts. Lamps are tungsten filament of 100-watt, 150-watt, 250-watt, and 500-watt. Air, water, oil, steam, and sewer pipes, and light and power cables, are carried under and between the shop buildings in a reinforced concrete tunnel 4 feet 6 inches wide by 6 feet high, which makes them easily accessible.

The size of each building was fixed by the estimated future requirements, as well as the requirements in sight during the construction period. The buildings were made large enough to

accommodate such of the large number of tools and machines on hand as were considered of value for permanent installation, and this in many cases fixed the size. In addition, allowance was made where considered necessary, for the installation of new special tools that it might be found necessary to purchase in the future to serve navy and other necessities that might arise. Of the original installation, comprising a little less than 400 machines, over 90 per cent were on hand and less than 10 per cent were purchased for the new shops. The accompanying table gives the dimensions and floor areas of Balboa shop buildings. The buildings, machinery installation, operating tunnel, etc., complete, have cost about $3,800,000. (See Table I.)

The mechanical division operates these and other shops on the Isthmus, including those at Paraiso, which are being maintained to serve the dredges and other marine equipment at work in Gaillard Cut and Gatun Lake. At the Atlantic end there is also at Mount Hope a marine equipment repair plant, known as the Cristobal shops, started in the French days, and the old French dry dock, which was enlarged in 1908 to meet the requirements of canal construction work. Its entrance is closed by a pair of wooden miter gates. Its dimensions are:

	Feet
Length from head to entrance	300.8
Total length from miter sill to head measured on center line	316.6
Width at entrance, full height	49.95
Width in body at coping level	69.33
Depth of water over sill (referred to mean sea level)	13.4

This dock has been constantly busy since the early construction days. Before the canal was opened, the larger vessels and floating equipment on the Pacific side were beached at Naos Island at high tide or deposited on the " gridiron " at Balboa. Barges and smaller equipment were repaired on the shipways at Balboa. As the elevation of the floor of the upper locks at Gatun is 14 feet above sea level, these locks can be entirely unwatered by gravity, and though the locks were not specially designed to carry the load imposed by vessels being dry docked therein, they can and have been used as dry docks, as in the case of the floating cranes and submarines. By using the locks floating caisson, which is equipped with a pumping plant, the other locks could, if necessary, be used for dry docking purposes.

TABLE I—DIMENSIONS AND FLOOR AREAS OF BALBOA SHOP BUILDINGS

	Building No.	Dimensions (Inside)	Ground floor area in sq. ft.	Number of floors	Total floor area in sq. ft.
I. SHOPS					
1. Tool department	1	58′6″ by 105′6½″	6,175	1	6,175
2. Erecting shop	1	58′6″ by 253′1½″	14,808	1	14,808
3. Machine shop	1	130′6″ by 358′8″	46,806	1	46,806
4. Forge shop	2	89′1″ by 274′1″	24,416	1	24,416
5. Pipe, tin and copper shop	2	89′1″ by 84′4″	7,513	1	7,513
6. Boiler and shipfitter shop	4	129′0″ by 358′8″	46,268	1	46,268
7. Planing mill, carpenter and pattern shop	8	121′4″ by 400′5″	48,580	1	48,580
8. Foundry (brass, iron and steel)	12	118′0″ by 316′6″ minus 4,117 sq. ft	33,230	1	34,508
9. Paint shop	6	49′8½″ by 252′11½″	12,570	1	12,570
10. Paint mixing and storage	26	22′6″ by 48′2½″	1,085	1	1,085
11. Car shop	7	122′4″ by 317′1″	38,790	1	38,790
12. Galvanizing, buffing, grinding and plating	9	39′4½″ by 147′11″	5,825	1	5,825
13. Oxy-acetylene	16	22′0″ by 41′1½″	904	1	904
II. STOREHOUSES					
1. General, 1st floor	5	118′8″ by 400′4″	47,496	2	94,230
General, 2d floor	5	118′8″ by 400′3″ minus 2, opens. 19′3½″ by 19′9″	46,734		
2. Steel, iron, and pipe storage	3	50′4″ by 359′5″	18,090	1	18,090
3. Lumber and equipment, foundry, supplies and dry kilns	10	122′4″ by 549′0″	67,160	1	67,160
4. Patterns	11	First floor, 58′8″ by 119′10″	7,029	2	14,002
		Second floor, 58′8″ by 119′10″ minus 7′2″ by 7′10″	6,973		
5. Coke	13	18′6″ by 167′10″	3,104	1	3,104
6. Sand bins	12	27′4½″ by 143′8½	3,934	1	3,934
III. HOSTLING LOCOMOTIVES					
1. Roundhouse	15	15 stalls	25,390	1	25,390
2. Sandhouse	27	19′0″ by 27′0″	513	1	513
IV. OFFICE	28	Each floor 50′10″ by 117′4″ and 2 wings 33′11″ by 47′10″ each.	9,208	3	27,624
V. TOILETS					
1. Seven toilet rooms for gold employees	17 to 25 inc.	1 @ 22′6½″ by 63′9″	....	..	1,437
		5 @ 22′0″ by 48′¼″	....	..	5,285
		1 @ 22′0″ by 23′7½″	....	..	519
2. Seven toilet rooms for silver employees		5 @ 22′0″ by 31′9″	....	..	3,493
		1 @ 22′0″ by 23′7½″	....	..	519
		1 @ 22′6½ by 15′10¼″	....	..	357
VI. POWER					
1. Boiler house	14	49′4″ by 49′10″	2,460	1	2,460
2. Compressor and pump-house	29	57′10″ by 242′0″ and 1 wing 29′7″ by 59′2″	13,750	1	13,750
3. Potash vat building	30	20′ by 20′	400	1	400
				Total	570,515

The superintendent of the mechanical division is, by executive order of January 27, 1914, a naval constructor, reporting to the Governor. The expenditures of the mechanical division for labor and material are averaging about $400,000 per month, and the number of employees is 2600.

FLOATING CRANES

Two 250-ton floating cranes of the revolving derrick type have been furnished as a part of the canal equipment. The number, capacity, and type were determined by the desire to provide facilities that would be readily available to step or unstep a lock gate leaf expeditiously, should the necessity ever arise. In fixing the reach, and the height to which the hooks can be raised, naval requirements have been met.

The cranes were purchased under general specifications issued by the Panama Canal, award going to the United States agents of a German firm, the Deutsche Maschinenfabrik A. G. of Duisburg, the lowest bidder, on cranes of a type that it had furnished many foreign governments and private shipyards, and that were in successful use. The contract price of each crane erected and delivered was $423,750. The *Hercules* was accepted in March, 1915, and the *Ajax* in September, 1915, and since then these cranes have performed useful service in connection with canal and commercial work, in handling heavy guns and equipment, and especially in connection with repairs to dredges working in Gaillard Cut. Each crane consists of a steel pontoon 150′ 2⅜″ long, 88′ 9¾″ wide, and 15′ 9″ deep at each side with a deck camber of 12″, containing a power plant and supporting the fixed and revolving superstructure. The power is steam-electric. Direct current at 220 volts is generated. All motions of the hooks are controlled by one operator. The pontoon is not self-propelling. It is divided by bulkheads into 26 water-tight compartments adjacent to the outside plating and 15 internal compartments not water-tight.

The fixed superstructure consists of a truncated steel framed pyramid which supports the revolving superstructure at its top. The latter consists of the "bell," which is a steel framework surrounding the pyramid and supporting the jib, the machinery-room, and the operator's cab; and the jib which is hinged to the "bell" at its top and carries the main and auxiliary hoists. Rotation about a vertical axis is accomplished by power applied between the "bell" and pyramid at the base. Movement of the jib in a vertical plane is secured by means of two links, attached to the jib, and to carriages driven by vertical screw spindles located at the rear of the "bell." The design eliminates uncertainty as to how the loads are carried. All vertical loads, "dead" and "live" of the revolving superstructure are carried at the top of the pyramid. The overturning moment of the live, dead, and wind loads is resisted by horizontal forces applied at

FLOATING CRANE "HERCULES" TRANSFERRING EQUIPMENT ACROSS GATUN LOCKS

the top and bottom of the pyramid. An area on the deck of the pontoon, 20′ x 60′, is designed to carry a live load of 2000 pounds per square foot.

The jib is provided with a main and an auxiliary hoist. The former is fixed at the point of the jib and consists of two blocks each of 125 gross tons capacity, arranged so that they can be linked together by an "equalizer bar" to form one hoist of 250 gross tons capacity. Each main hoist block is suspended by 10 parts of 2-inch wire rope. The auxiliary hoist has a capacity of 15 gross tons and consists of a two-part block swung from a traveling trolley supported on a runway on the lower side of the jib. The main hoist can handle the maximum loads while revolving completely, and can also be luffed in and out. The main hoist was required to have the following capacities at the reaches stated, "reach" being the horizontal distance from face of the pontoon fender to center of block. Before acceptance they were subjected to loads 20 per cent in excess of their rated loads.

	Tons of 2240 pounds		
Maximum rated load	100 tons	150 tons	250 tons
	Feet	Feet	Feet
Reach over end	80.1	59.0	21.0
Reach over side	81.6	62.4	22.3

The maximum height of hook on equalizer bar above water is as follows:

	Feet
In 100-ton position	126
In 150-ton position	154
In 250-ton position	182

The speed of hoisting the main blocks is as follows:

	Feet per minute
With 250-ton load	3.5
With 125-ton load	7.0
With 62½-ton load	14.0

The auxiliary hoist was tested to 33⅓ per cent excess load over its rated capacity, or 20 gross tons, before acceptance. The speed of hoisting the auxiliary block fully loaded is 40 feet per minute.

Depending upon conditions, the crane can make one complete revolution in from five to eight minutes. The average freeboard of the pontoons of the unloaded cranes when tested was 8.25 feet, and the minimum freeboard for the loaded cranes without deck load was about 2.8 feet. The maximum longitudinal inclination of the pontoon was approximately two degrees, and the maximum transverse inclination 4½ degrees for loads within the rated capacity. The total weight of material in each crane, including pontoon, concrete counterweight, etc., is approximately 3400 short tons. These cranes have proved themselves to be exceedingly useful through their great flexibility.

FUELING PLANTS

No expense has been spared by the Panama Canal to make the canal fueling plants adequate for all requirements. As a measure of economy, in designing the coaling plants, arrangements for the storage of coal were so made that all coal for canal and commercial use could be handled by the same machinery. Following the adoption in January, 1913, of the policy by which the United States retains direct control of all the shore line and improved water front at the terminals, it became necessary to provide sufficient area in the coaling plants for leasing to individuals and companies desiring to store and sell coal on the Isthmus. Existing legislation does not permit the leasing of any land in the canal zone, except for agricultural purposes, and land could be occupied by a private coal plant only under a revocable license issued by the Panama Canal, terminable at the pleasure of the government, without liability for reimbursement on account of any improvements made. This is not a situation that would encourage the investment of capital in private coaling plants on the Isthmus, even if they were desired by the Panama Canal. About one-third of the storage area of each coaling plant has, therefore, been made available for use by individuals and companies if desired. A large number of tentative applications for space have been received, but with the low price for Panama Canal coal, and with the present high transportation rates, there is no opportunity under present conditions for any private company to enter the coal business at the Isthmus at a profit, and no leases have thus far been made.

During the canal construction period, the Panama Railroad has handled the sale of all coal on the isthmus, the amount in long tons by fiscal years being as follows:

1905... 75,673	1909... 357,125	1913... 462,246
1906... 130,383	1910... 481,039	1914... 325,646
1907... 203,451	1911... 490,864	1915... 369,955
1908... 368,331	1912... 491,494	

A total of 3,756,207 tons in 11 years.

For the fuel oil plants, the Panama Canal retains similarly control of the oil berths, and requires all oil to be handled through the Panama Canal pumping plants for which the present charge is 3½ cents, each way, per barrel of 42 gallons. Tank farms at

each terminal have been laid out where the land is not needed for other purposes, divided up into lots for oil tanks, and leased to oil companies under revocable license. The policy of United States control of all transportation across the isthmus, and the desire not to permit any method of transportation that would lessen canal traffic, effectually bars the construction of a trans-isthmian oil pipe line by either the Panama Canal or by any private interest. In 1906 the Union Oil Company was permitted to lay an oil line across the isthmus under a revocable license, under the terms of which the Panama Canal could purchase such oil as it required during the construction period. This line was taken up when this license expired on December 31, 1914, and since then the Panama Canal has supplied requirements with its own plants. The purchases of fuel oil from the Union Oil Company during the fiscal years given, in barrels of 42 gallons, were as follows: For the greater portion of this oil, the price was $1.10 per barrel, delivered into Panama Canal service tanks.

1907....	6	1910.....	1,143,539	1913.....	675,407
1908.....	17,405	1911.....	888,940	1914.....	365,859
1909.....	239,623	1912.....	694,137	1915.....	198,590

Total, 4,223,506 bbls.

Two coaling plants have been built, one plant being located at the Atlantic terminal and one at Balboa.

The plant at Cristobal has been designed to unload and store coal at the rate of 1000 short tons per hour, by means of four standard unloading towers, which are being furnished by the Hunt Construction Company, and to dig from the stock pile and deliver at the end of the four reloader tower chutes coal at the rate of 2000 short tons per hour. The two large stocking and reclaiming bridges; the conveyor system, consisting of eighty-eight 10-ton capacity electrically-driven cars and supporting viaduct; the four reloader towers, the power plant, and the bunker and conveyor tower on the end wharf are being furnished by Mr. Augustus Smith, who has furnished the machinery and structural material for several of the navy coaling plants. Mr. Smith's design for the machinery for both the Cristobal and Balboa plants was based on general specifications issued by the Panama Canal. All of the machinery is being furnished by him, except the unloader towers referred to above, which have been made to conform to his design.

The Panama Canal built the wharf, and performed the remainder of the work, with its own forces. The plant consists essentially of a storage pile 307 feet wide and 1700 feet long, surrounded at one end, and on two sides for 1000 feet, by steel and concrete wharves which carry the viaduct and the machinery units. Coal is received from colliers along one side, called the unloader wharf, and is reloaded into colliers, barges or vessels along the other 1000-foot wharf, called the reloader wharf. On the end wharf is an elevated bunker having a storage capacity of 1500 tons, which is equipped with six adjustable chutes. The coaling pier has a total berthing space of 2588 feet, or five standard 500-foot berths. The rates for receiving and delivering coal at the Balboa plant are one-half those of the Cristobal plant; and the berthing space at the Balboa plant is somewhat more than one-half that of the Cristobal plant.

These plants, which were ready to go into operation in the latter part of 1916, have been awaiting the completion of the machinery contractors' work since early in 1916. It has been decided that the Panama Railroad shall operate these plants for the Panama Canal. The Cristobal plant represents an investment of about $3,500,000, including connection with the main line of the Panama Railroad across the French canal, of which about $1,650,000 has been for the machinery and the remainder has been for the steel and concrete wharves and other foundations for the machinery, dredging, grading, fill, railroad connection, etc. In addition, dredging alongside the coaling pier and adjacent thereto has cost about $500,000. The Panama Railroad has contributed $1,000,000 toward the cost of this plant, and the Panama Canal the balance.

The Balboa plant, not including the wharves—which would have been built in any case—has cost about $1,250,000. In lieu of stocking and reclaiming bridges for the Balboa plant, four large cantilever cranes, which were used on the construction of the Pacific locks, have been fitted up for this purpose. The coal docks of each plant have been furnished with fresh water and fuel oil conduits, with outlets at frequent intervals.

The present price for coal for steamships, trimmed in bunkers, and using the ship's gear, is as follows:

At Cristobal	$8.00 per ton of 2240 pounds
At Balboa	9.50 per ton of 2240 pounds

Of the total cost of coal delivered at the isthmus, about one-third represents the cost at the mine, one-third rail transportation to seaboard, and one-third water transportation to the isthmus. The first two items are quite firmly established. It is important to the canal to control the third item, water transportation, and to be independent of commercial fluctuations in water transportation rates. It was considered of great importance, also, that the Panama Canal should transport coal to the isthmus in its own colliers. This led to representations being made along these lines, in 1912, and an appropriation being made in June, 1913, under the Panama Canal for

> The construction in the United States in the government or private yards, in accordance with plans and specifications to be prepared by the Navy Department, and to have a cargo capacity of 12,000 tons of coal and a speed of not less than 14 knots per hour, two colliers to cost not to exceed $1,000,000 each.

A contract was awarded to the Maryland Steel Company for the construction of the two colliers named *Achilles* and *Ulysses* at $987,500 each in April, 1914, with time of delivery 16 months. These colliers were put in commission in June and April, 1915, respectively, and are being operated by the Panama Railroad Company for the Panama Canal in a manner somewhat similar to the operation of the vessels of the Panama Railroad Steamship Line. The cost of these colliers was excluded by Congress from the estimated cost of the canal of $375,200,900. The operation of these colliers has been so satisfactory from a financial standpoint, as well as otherwise, that an appropriation was made for the construction of two additional colliers, by the Sundry Civil Bill for 1916-1917, in view of the necessity of providing additional means for the transportation of coal to meet the growing demands of the canal. It is expected that these colliers will cost approximately $1,500,000 each.

The Panama railroad has also made arrangements to enable vessels to be bunkered while lying in the stream or at commercial docks and piers, by fitting up for this service a number of old steel barges having a dead weight capacity of about 500 tons, that have been used in the past in construction service. Two of these barges have locomotive cranes, with long booms, that operate clam-shell buckets. Two others are equipped with De Mayo towers, and it is proposed to equip two additional barges with De Mayo towers.

as soon as the barges are released from construction work. Contract has been awarded the United States Steel Products Company for two steel barges for delivery early in 1917, having a capacity of not less than 500 tons of coal, and equipped with a system of horizontal and vertical continuous conveyors, and unloading chutes, as to make the barges self-discharging. There are also three 500-ton steel barges in the coal service without any discharging equipment. A half dozen additional barges of this type will be released from the construction service before 1917 and will be transferred to the coaling service.

The Panama Railroad has also made provision at the docks and piers at each end of the canal whereby De Mayo towers can be handled from booms attached to the pier sheds, and worked in specially built 50-ton coal cars to coal ships lying alongside. It is expected that quite a fleet of coal barges will be required at each end of the canal to meet commercial requirements.

All coal is purchased by the Panama Railroad under annual contract. The contract that terminated in September, 1916, called for the delivery at tidewater, loaded into colliers, of any portion of 400,000 long tons of coal at $2.60 per ton, and permitted the Panama Railroad to purchase any portion of 300,000 tons, in addition, at $2.64 per ton.

The specifications are prepared in consultation with the Bureau of Mines, and all coal is inspected by a representative of the Bureau of Mines; and samples are taken while the coal is being dumped from cars into the colliers. The results of tests made on the samples of coal determine the adjustment made in the contract price, as described below. Coal is required to be of best quality, steaming, semi-bituminous, run-of-mine, and to contain when actually delivered not to exceed:

	Per cent
Moisture	3
Ash	6½
Volatile matter	21
Sulphur	1
Fixed Carbon, not to be less than	72½
British Thermal Units, per pound of dry coal, to be not less than	14,700

When delivered in cars, alongside steamer, at least 65 per cent is required to pass over a screen with ¾" square openings, and at least 30 per cent over a 3" bar screen. For coal which contains more than 3 per cent moisture a deduction in price of two cents per ton for each per cent in

excess is made. Adjustment in price for B. T. U. (dry coal) variations from the standard of 14,700 is determined by the following formula:

$$\frac{(\text{Variation in B. T. U.})^2}{7500} = \text{price adjustment in cents per ton.}$$

In addition to the foregoing adjustment, in case the coal analyses on the "dry basis" below 14,200 B. T. U. per pound, a deduction, as a penalty, of 10 per cent of the value of such coal is made.

The fuel oil plants at each terminal include the necessary outlets on cribs or wharves, the pipe lines between the water front and the tank farms, the pumping plants, and the tanks. Both the Panama Canal and private companies own tanks, and the latter are required to furnish the pipe lines connecting the tanks with the pumping plant. The Panama Canal owns the remainder of the pipe lines. The plants are each able to handle oil from storage tanks to or from three vessels simultaneously, at a minimum rate of 1200 barrels per hour per vessel; and the pumps have sufficient power to make deliveries to any Panama Canal service tanks located within a radius of eight miles at the rate of 400 barrels per hour. At Balboa, oil is received at Dock No. 2, the oil crib, and at Cristobal at Dock No. 13. The receiving rate depends upon the capacity of the ship's pumps, and vessels have been unloaded at an average rate of over 2000 barrels per hour. Oil can be delivered at Balboa either at Dock No. 2, the oil crib, Dock No. 4, the old French pier, or Dock No. 6, the reloader wharf. At Cristobal there are outlets on Dock No. 13, and also 14 outlets along three sides of the coaling pier, Dock No. 16. The rate of delivery has proved to be the capacity of the vessel to receive oil, and the oil pumps have not been called upon to deliver at their full capacity.

Oil is handled by steam-driven pumps through pipes generally either 10 inches or 12 inches in diameter. A manifold is located outside the pump-house, consisting of 12-inch cast iron headers, valves and fittings to accomplish the following:

(a) The suction and discharge pipe of any pump in the handling plant can be connected with the pipe line to any tank in the tank farm. The manifold can be extended indefinitely to meet the further demands resulting from the construction of additional tanks.

(b) The manifold permits oil to be taken or delivered between the tank farm and three outlets at the water front simultaneously with or without the assistance of the pumps in the handling plant, as desired.

The Panama Canal purchases fuel oil under annual contract. The specifications fix the minimum flash point at 150° F., and the gravity between 16° and 24° Baumé. Oil containing more than 2 per cent of water and sand is subject to a reduction in price for such excess, and in no case is oil containing more than 5 per cent acceptable.

The present price charged by the Panama Canal for fuel oil is as follows:

	Per barrel
At Balboa	$1.65
At Cristobal	1.90

For Diesel engine oil, the price is $2.50 per barrel.

For gasoline, the price charged ships is 20½ cents per gallon.

DOCKS AND PIERS

Permanent docks and piers of concrete and steel construction, completed or under construction, comprise the following, with length of berthing space approximately as stated:

CRISTOBAL	Lineal Feet
Commercial Pier No. 7	2450
Commercial Pier No. 8	2368
Commercial Dock No. 9	1150
Commercial Dock No. 10	423
Coaling Pier No. 16	2588
Total	8979

There is also a small boat landing of concrete between piers Nos. 8 and 9, 410 feet long. In addition, an appropriation has been made for pier No. 6, with a berthing space of 2450 feet, which will give a total length of 11,839 feet, including the small boat landing, by the end of the calendar year 1918. Landings for tugs, launches, etc., will be constructed between piers Nos. 6 and 7, and between Nos. 7 and 8, having a total length of about 800 feet, as soon as the necessity for same develops.

Commercial docks and piers Nos. 7, 8, 9 and 10, and the small boat landing between Nos. 8 and 9, cost the Panama Railroad Company $3,450,000, or about $500 per lineal foot of berthing space. Dredging around the piers and docks cost $800,000, of which the Panama Railroad paid $300,000.

The depth of water referred to mean sea level alongside all permanent docks is 41 feet. The elevation of the floor of the

docks above mean sea level varies from 10.2 to 11.5 feet. The average tidal range is 11 inches. In addition to the concrete and steel docks, there are a number of wooden docks and piers in Colon and Cristobal, which, while available for use at the present time, not being rat-proof, must, in accordance with health department regulations for the terminal ports, approved by the Governor, be removed before January 1, 1919, as on and after that date no docks, other than rat-proof docks, will be permitted in either Canal Zone or Panamanian waters at the canal terminals, in order to safeguard against the introduction and spread of bubonic plague.

At Colon, wooden piers Nos. 2, 3 and 4, have a berthing length of 2918 feet, with depth of water alongside from about 18 feet to 30 feet. Of these, Pier No. 3 is owned and used by the Royal Mail Steam Packet Company. Under its original franchise, the Panama Railroad was given control of all water frontage in Colon. In its early days the Panama Railroad disposed of two strips of water front to two steamship lines. The Pacific Mail Steamship Company succeeded to the title of one of these strips, which was re-purchased by the Panama Railroad Company in 1915, in order to carry out the policy adopted in 1913 for the control of all water frontage at the terminals by the Panama Canal or the Panama Railroad. Negotiations are under way similarily for the re-purchase by the Panama Railroad Company of the Royal Mail Steam Packet Company's lot. When old piers Nos. 2, 3 and 4 at Colon are dismantled, the berthing of all vessels at the Atlantic terminal will be entirely and permanently transferred from Panamanian waters to Cristobal, in the canal zone.

In Cristobal there remain wooden docks Nos. 11, 13, 14 and 15, having a total length of 4011 feet, which will also be removed before 1919. These docks were all built during the canal construction period and are not in a good state of repair. The depth of water alongside varies from 25 feet to 35 feet, except at Dock No. 15, where the depth of water is from 15 to 20 feet.

There is also a piece of old wooden dock about 315 feet in length called the " angle dock " between the old French pier, Dock No. 4, and coal Dock No. 6, which will have to be replaced with permanent construction before 1919.

Docks Nos. 6, 7, 9, 13, 14, 15, 16, 17, 19, and Pier No. 18 cost approximately $3,650,000, or $465 per lineal foot of berthing space, of which the Panama Canal paid $3,500,000. In addition, the

dredging of the inner basin, and around piers and docks, is costing $1,900,000 without the extension, which was recently appropriated for, of which the Panama Canal pays $1,650,000.

At Balboa are the following steel and concrete docks and piers:

	Lineal feet
Reloading Coal Dock No. 6	745
Unloading Coal Dock No. 7	1052
Entrance Dock No. 9	481
Repair Dock No. 13	290
Repair Dock No. 14	775
Commercial Dock No. 15	1146
Commercial Dock No. 16	742
Commercial Pier No. 18	2201
Total	7332

In addition are the following special docks of steel and concrete:

Quarantine Landing, Dock No. 1, for small boats	60
Oil Crib "C," Dock No. 2, having a frontage of about 60 feet and a berthing length of about	600
Old French Pier, Dock No. 4 (steel and concrete)	1000
Small boat landings, Nos. 17 and 19, having a length of	490
Total	2150

At Balboa the depth of water in front of all docks and piers is 45 feet, referred to mean sea level, or 37.4 feet referred to mean low water, ordinary spring tides, except in front of Dock No. 1, the quarantine landing, where the depth of water is 20 feet, and in front of Dock No. 4, the old French pier, where the depth is 30 feet, although this depth can be readily increased to 45 feet when desired. The elevation of the deck of the docks above mean sea level varies from 16.5 feet to 17 feet, except for Dock No. 4, the old French pier, which has an elevation of 20.3 feet.

The deck or platform type of construction, with supports consisting of cylinders of concrete from six to eight feet in diameter, carried down to rock, has been followed for both docks and piers, in nearly all cases. The docks are tied back by steel anchors embedded in firm material. With piers, the lateral pressure of the earth was generally removed by dredging all material underneath to the full depth of the adjacent channel. This type of construction was adopted in preference to the more usual gravity type of quay wall, on account of the great depth to hard bottom—in some

places as great as 125 feet—and the necessity of obtaining as great an amount of berthing space as possible with the funds available, and in the shortest time.

The platform of the docks and piers was generally constructed of steel floor beams and girders encased in concrete, with a deck slab of reinforced concrete. In some cases, where the conditions were suitable, the floor beams and girders were constructed of reinforced concrete. Most of the docks and piers are paved with vitrified brick, laid on edge. In nearly all cases a railroad track has been provided close to the water's edge, and generally one or more tracks has been laid immediately back of the docks, and in the center of the piers. Where cargo is handled, these latter tracks are usually " depressed."

The commercial docks and piers are protected by sheds of steel and concrete, with tile roofs, one story in height, with large steel doors either of the rolling Kinnear type or the lifting Ogden type.

At Cristobal it is expected that practically all of the berthing space will be required for commercial use. At Balboa, docks Nos. 13 and 14 adjacent to the principal shops, having a length of about 1000 feet, have been assigned for berthing vessels under repair. The remaining berthing space is available for commercial use, as may be necessary. There has always been considerable speculation on the isthmus as to the extent to which the Panama Canal would be justified in fitting up the commercial docks and piers with power appliances for the regular handling of cargo out of and into vessels. For unusually heavy lifts, either floating cranes or locomotive cranes will always be available. At Cristobal, along the outside of the dock and pier sheds, attachments for overhead blocks have been furnished by steel columns with a line of elevated longitudinal girders, to supplement the ships' gear. At Balboa, where the extreme range of tides is 21.8 feet, the average west coast vessel is not equipped with long enough cargo booms to work its cargo at low stages of the tide. Dock No. 4, the old French pier, has an outfit of twelve 4-ton electric cranes of the horizontal transporter type, and one pillar crane of 20 tons capacity. The shed of Pier No. 18 is provided with columns extending above the eaves, which support a line of elevated longitudinal girders for attaching blocks. At alternate columns there are also 65-foot booms on brackets 27.5 feet above the floor, having a capacity of three tons each and operated by portable electric winches. Electric

trucks, of one and two tons capacity, are used in considerable numbers on the docks at each terminal.

There has also been much conjecture, first, as to whether much freight would "break bulk" at the canal, and, second, which port would do the greatest amount of business of this character. The Panama Railroad ceased to be a factor in trans-isthmian transportation as regards through business with the opening of the canal, in line with the policy which is designed not to permit competition with the canal. The Panama Railroad, therefore, became a passenger line except for the carrying of local, canal and commercial freight. With the cessation of the shipment of through freight across the isthmus by rail, it became necessary at first for the Panama Railroad Steamship Line to run its vessels through the canal to Balboa to reduce the accumulation of freight at the terminals. Within a short time, arrangements were made by west coast steamship lines, including the South American Steamship Company, the Peruvian Steamship Line, and the Pacific Steam Navigation Company, so that their vessels go through the canal and make Cristobal a terminal port, thus doing away with the necessity of the Panama Railroad steamers transiting the canal. This has made Cristobal the most important commercial terminal, and it seems fair to assume that Balboa's importance as a commercial terminal for the transfer of cargo will always remain secondary to Cristobal. This result works out very well with the policy of equipping Balboa with the principal facilities for dry-docking and repairing vessels, but may necessitate a considerable extension of the present docking and repair facilities at Cristobal.

The general layout of each terminal provides room for the construction of two additional piers at Cristobal, Nos. 4 and 5, behind the mole; and the construction of four additional piers at the head of the inner basin extended, at Balboa, should the future growth of canal traffic render their construction necessary. There will undoubtedly be improvements and additions to the terminals required for a number of years to come to keep pace with the growing requirements. At Balboa, it is believed that the early completion of Dry Dock No. 2, the cost of which is comparatively small, will be found desirable, and that the location and design of a permanent repair and dry dock plant at the Atlantic terminal is a project that will have to be given attention in the near future.

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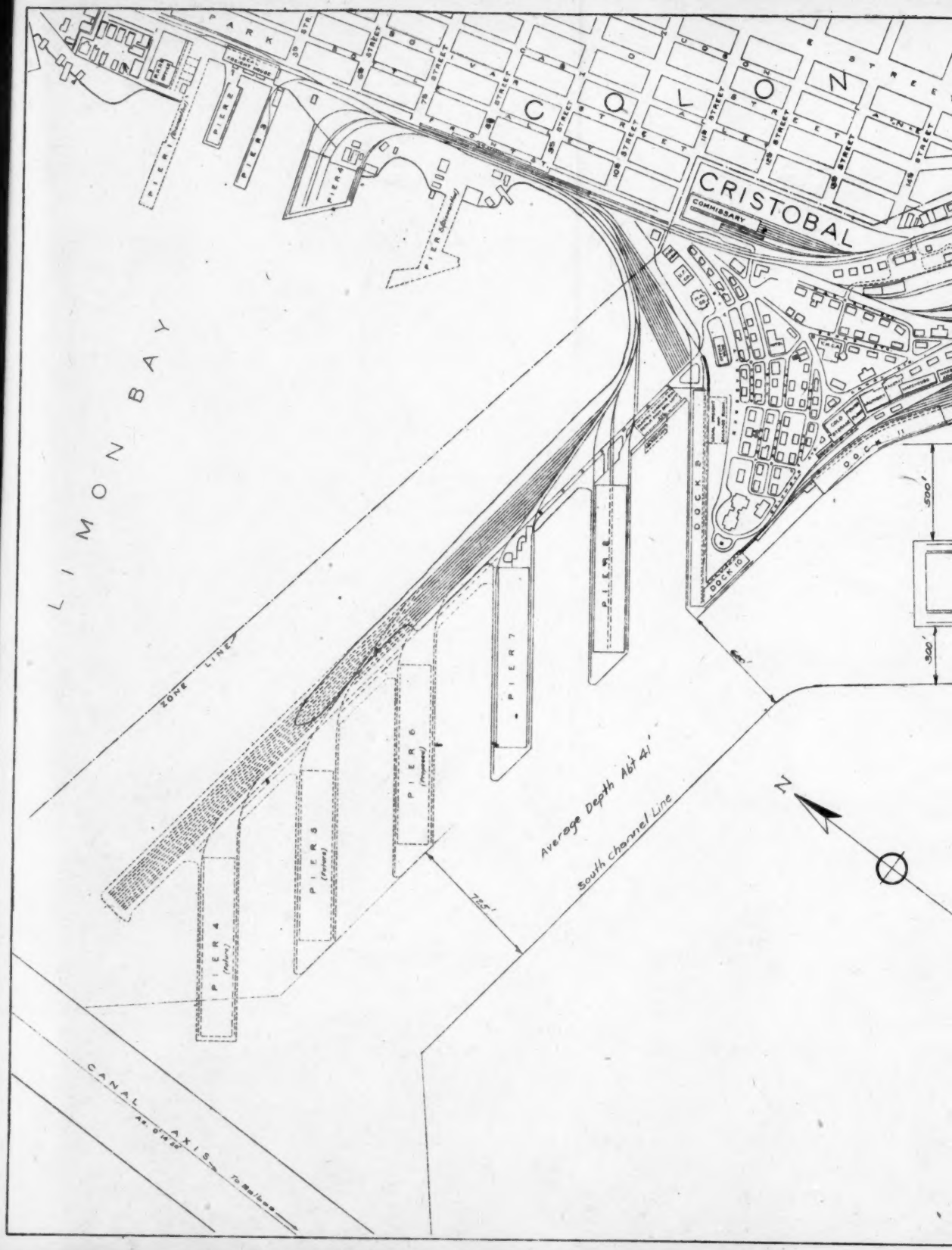
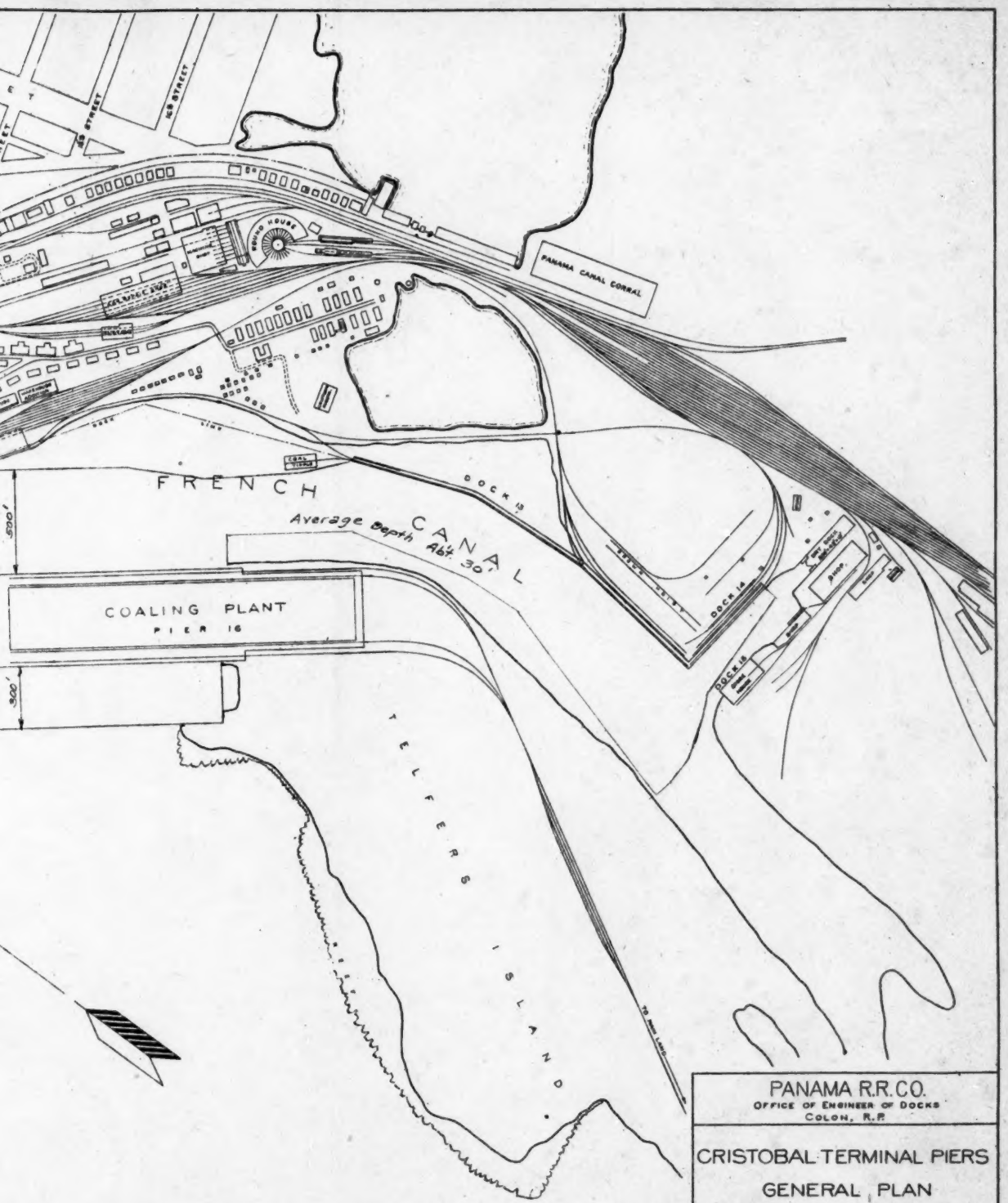

PARK
COLON
CRISTOBAL
COMMISSARY
LIMON BAY
ZONE LINE
PIER 1
PIER 2
PIER 3
PIER 4
PIER 5
PIER 6
PIER 7
PIER 8
DOCK 8
DOCK 10
PIERS (Future)
PIER 4 (Future)
Average Depth Abt 41'
South channel Line
765'
500'
300'
N
CANAL AXIS
To Balboa



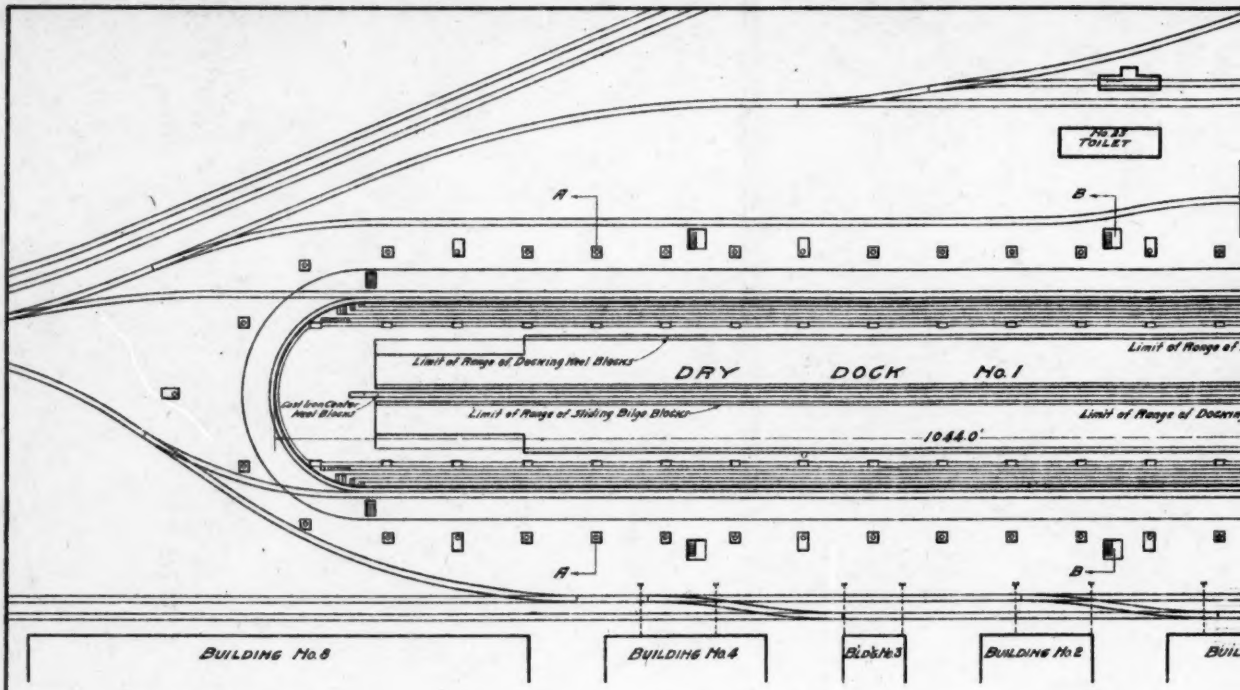
PANAMA R.R.CO.
OFFICE OF ENGINEER OF DOCKS
COLON, R.P.

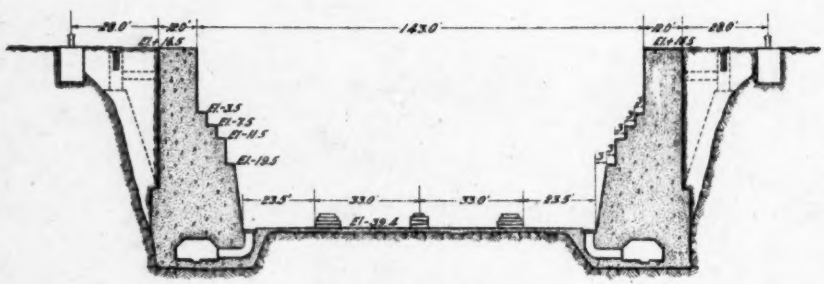
CRISTOBAL TERMINAL PIERS
GENERAL PLAN

MADE BY JK	SCALE = 1:2000
TRACED BY JK	
CHECKED BY Fw Blackwood	DATE Nov 16th 1914
SUBMITTED ENGINEER OF DOCKS	REVIEWED SUPERINTENDENT
RECOMMENDED ENGINEER OF TERMINAL CONST. PANAMA CANAL	APPROVED PRESIDENT

THE LORD BALTIMORE PRESS, BALTO., MD.

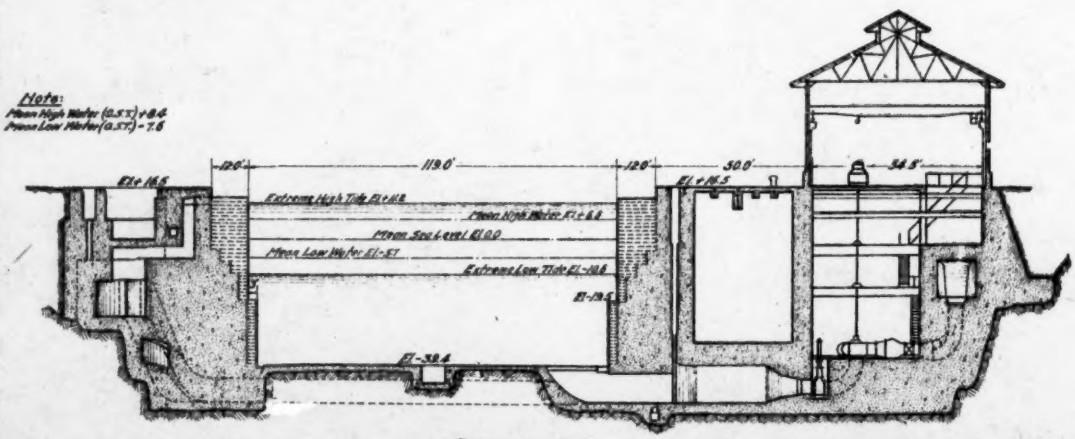
DRWG NO: 4604-5



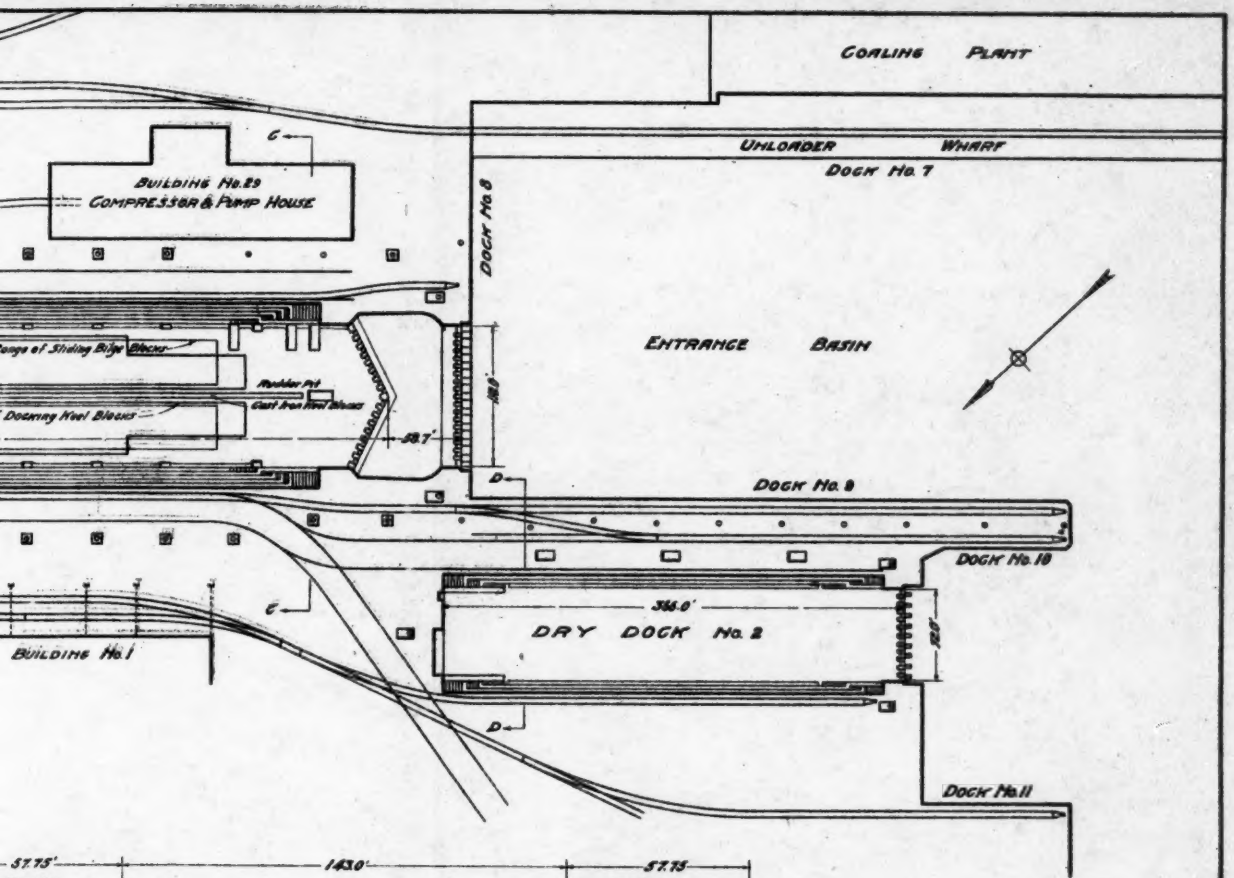


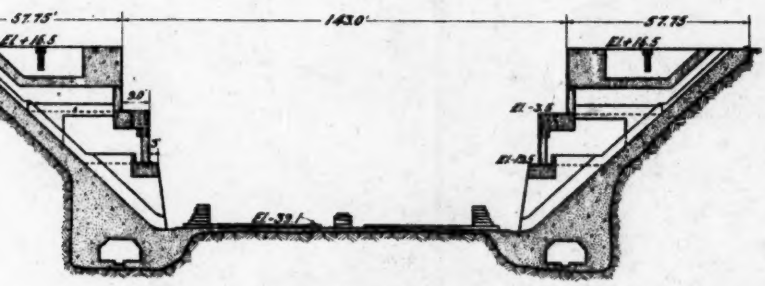
SECTION A-A

Note:
Mean High Water (0.57) +8.4
Mean Low Water (0.57) -7.8

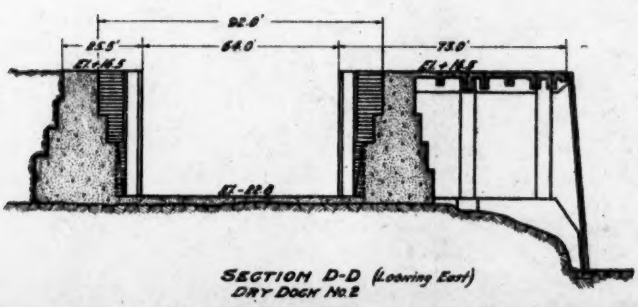


SECTION C-C





SECTION B-B



SECTION D-D (Looking East)
DRY DOCK No. 2

THE PANAMA CANAL

DEPARTMENT OF OPERATION AND MAINTENANCE
DIVISION OF TERMINAL CONSTRUCTION
BALBOA HEIGHTS, CANAL ZONE.

PACIFIC TERMINALS

DRY DOCKS
GENERAL PLAN AND SECTIONS

HEAD PLAN 1" = 80 FEET
SECTIONS 1" = 40 FEET
MAP No. 1004

Made by C. D. Hansen

J.N. Rousseau
Engineer of Terminal Construction

F.W. Cooke
Engineering Engineer

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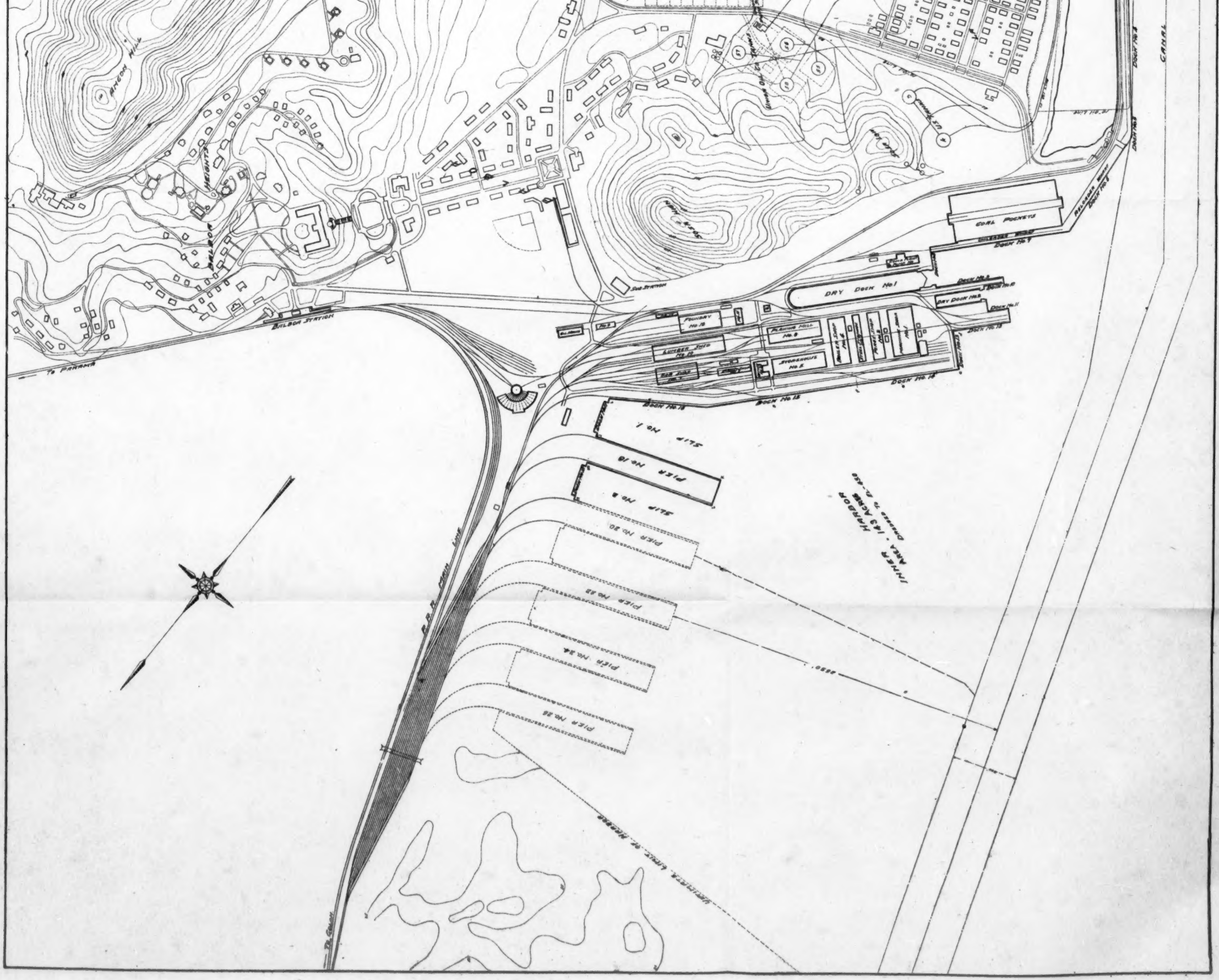
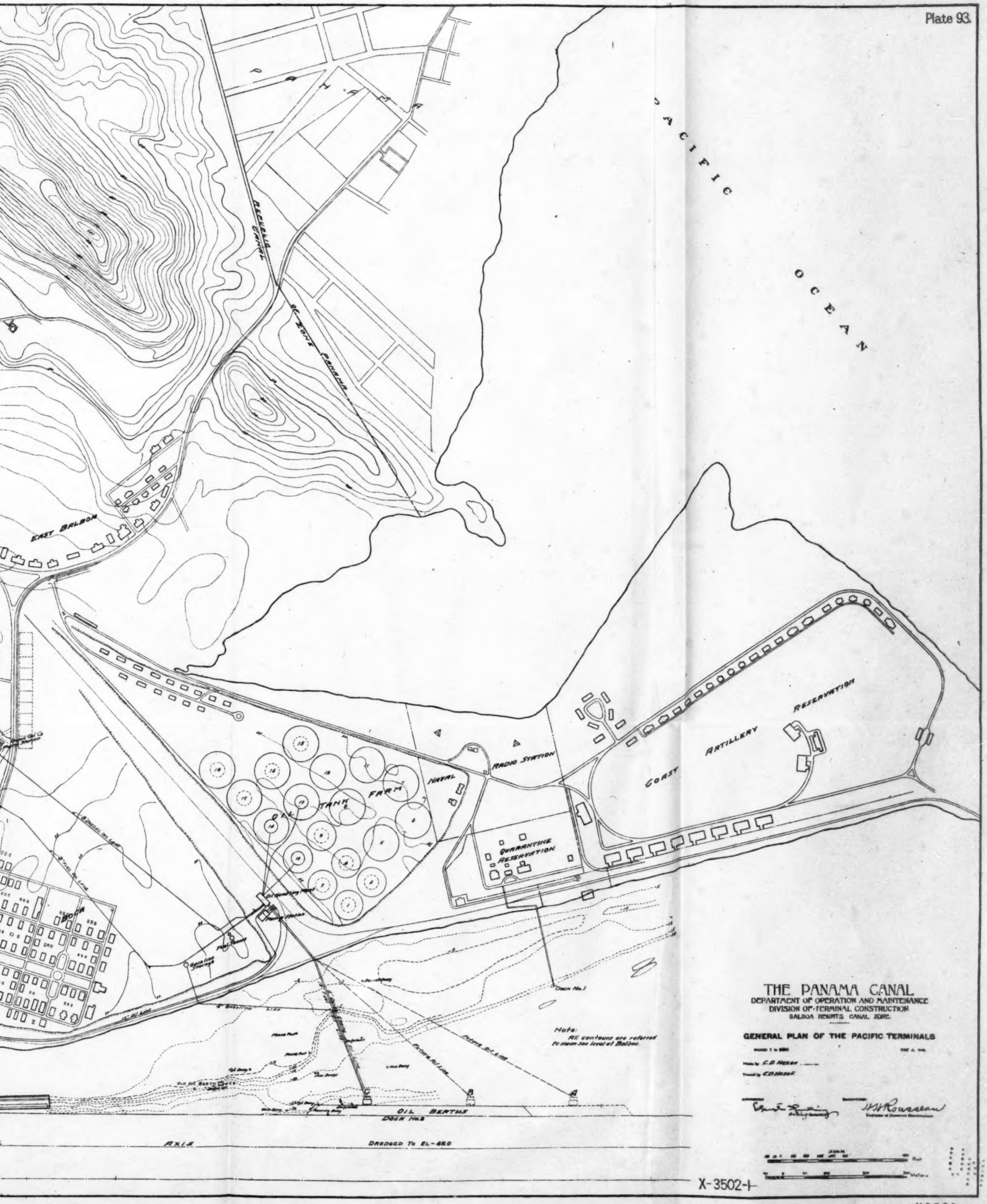

Balboa Hill
Balboa Heights
Balboa Station
To Panama
Sub-Station
Dry Dock No 1
Dry Dock No 2
Dry Dock No 3
Dock No 1
Dock No 2
Dock No 3
Dock No 4
Dock No 5
Dock No 6
Dock No 7
Dock No 8
Dock No 9
Dock No 10
Dock No 11
Dock No 12
Dock No 13
Dock No 14
Dock No 15
Dock No 16
Dock No 17
Dock No 18
Coal Pockets
Foundry No 19
Machine Shop No 9
Joiners Shop No 10
Blacksmiths No 5
Pier No 1
Slip No 1
Pier No 18
Slip No 2
Pier No 20
Pier No 22
Pier No 24
Pier No 26
Harbor Area - 143 Acres
Inner Harbor Limit
Pacific Entrance to Panama Canal
Canal



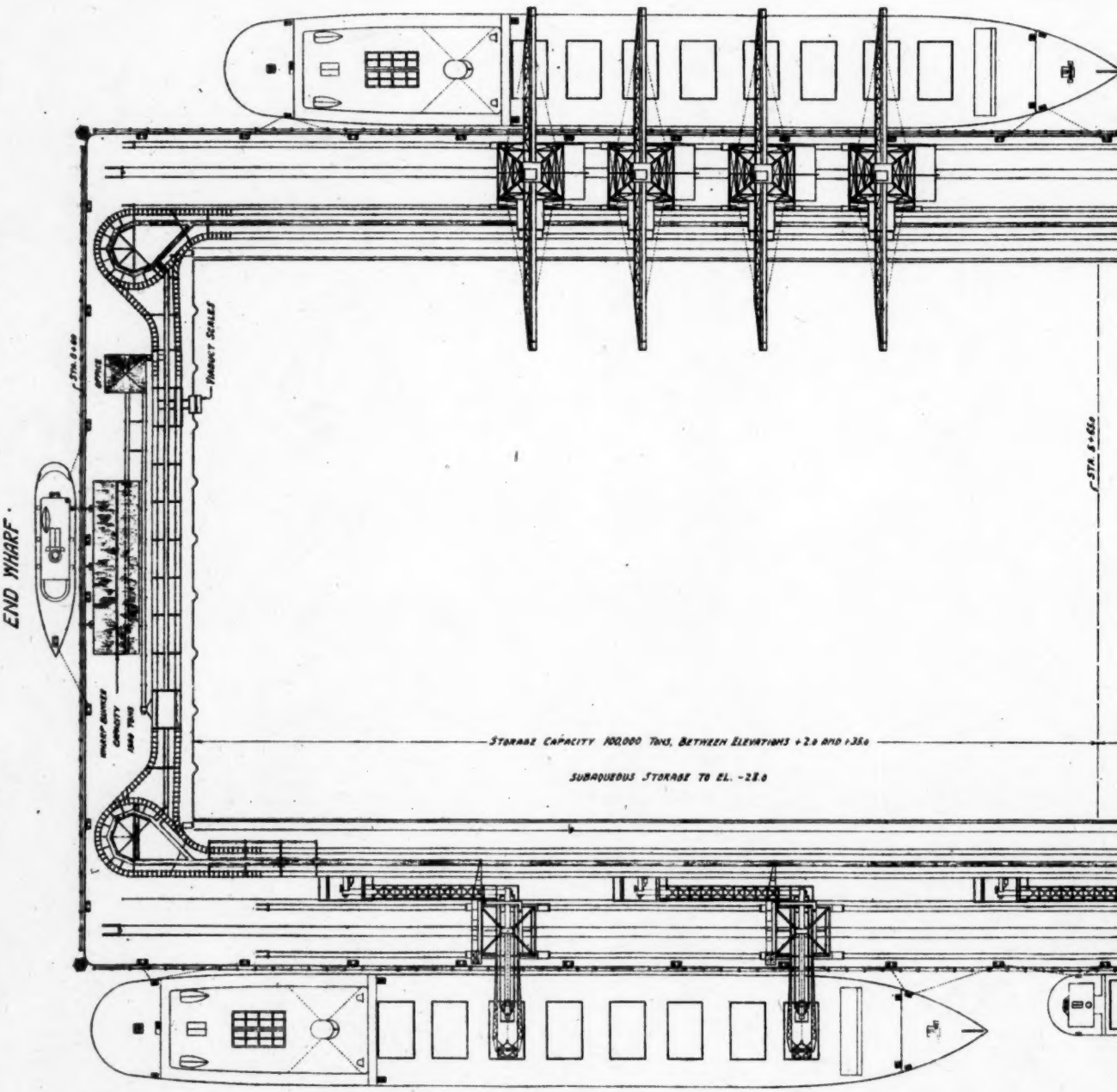
THE PANAMA CANAL

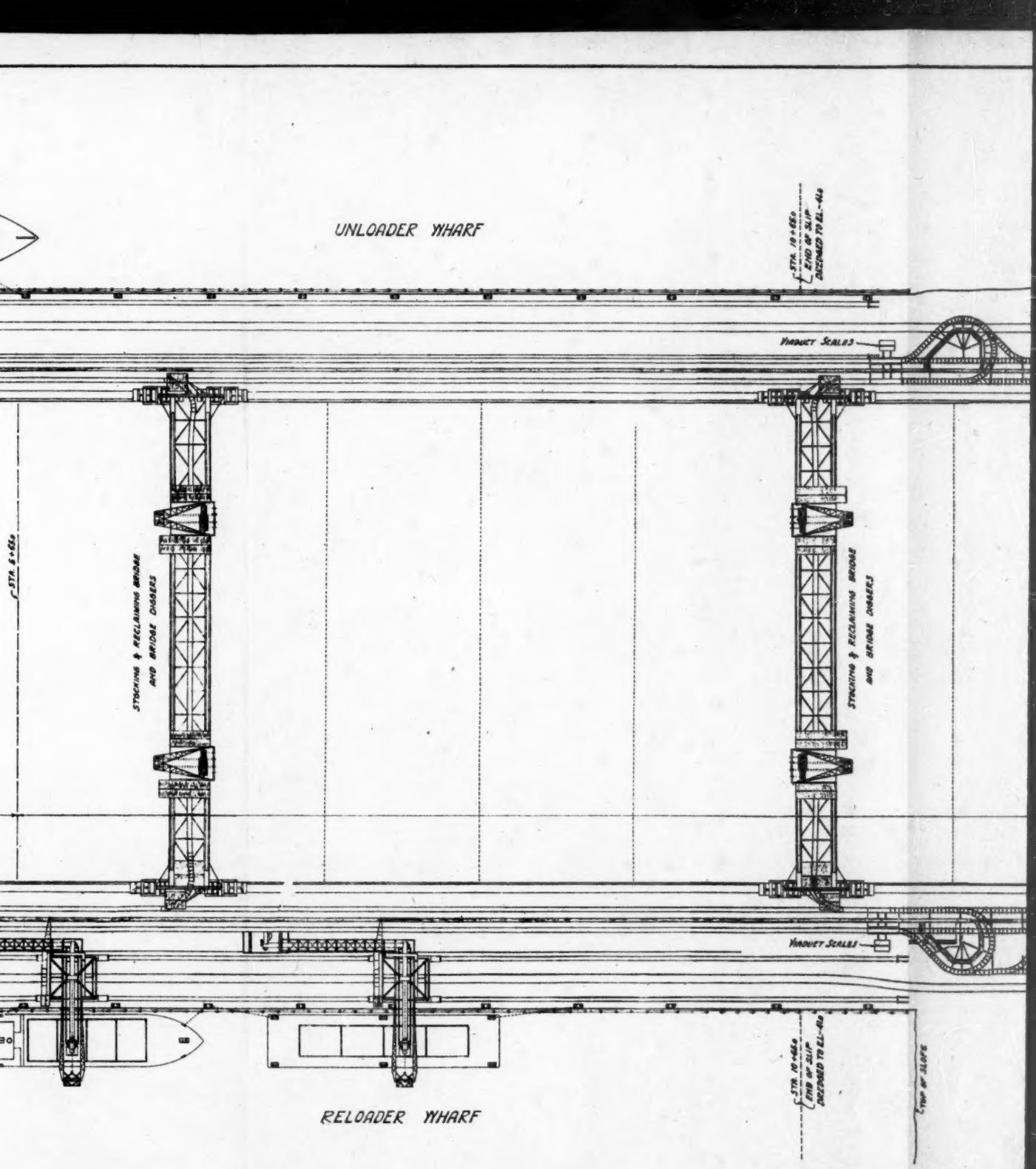
DEPARTMENT OF OPERATION AND MAINTENANCE
DIVISION OF TERMINAL CONSTRUCTION
BALBOA HEIGHTS, CANAL ZONE.

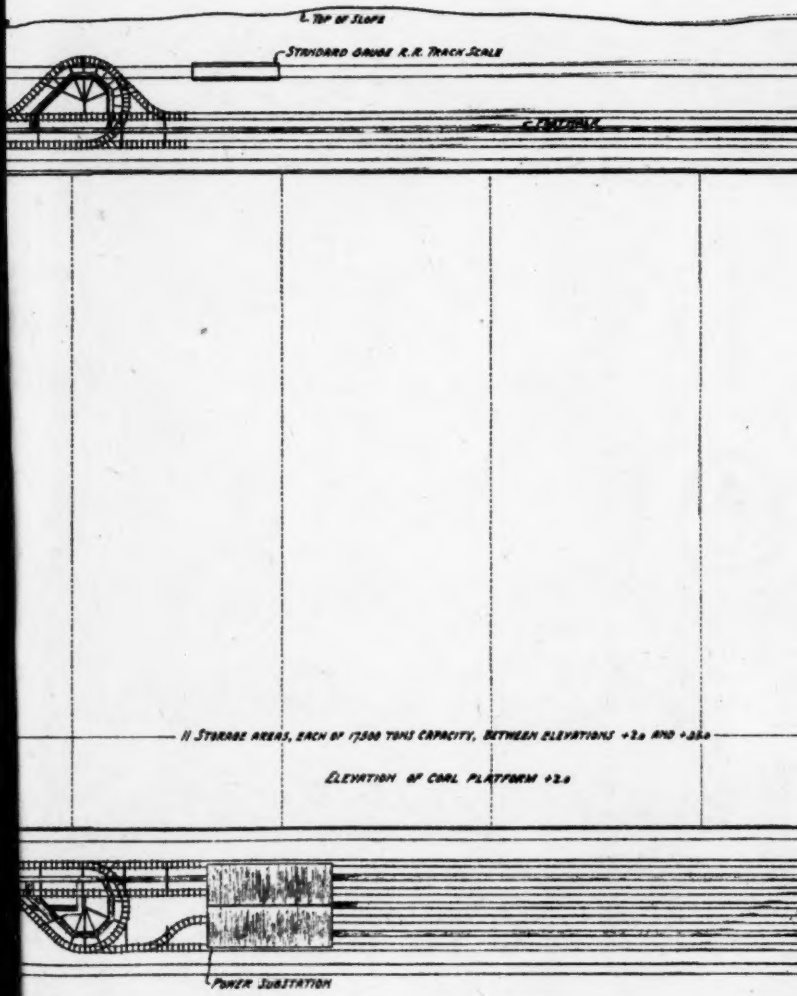
GENERAL PLAN OF THE PACIFIC TERMINALS

X-3502-1

THE LORD BALTIMORE PRESS, BALTO., MD. X-3502-1


END WHARF.
STA. 0+00
OFFICE
MARKET SCALES
MARKET BUNKER CAPACITY 200 TONS
STA. 8+65.0
STORAGE CAPACITY 100,000 TONS, BETWEEN ELEVATIONS +2.0 AND +35.0
SUBAQUEOUS STORAGE TO EL. -28.0


UNLOADER WHARF
STA. 10+60
END OF SLIP
DREDGED TO EL.-40
WABUET SCALES
STA. 8+60
STOCKING & RECLAIMING BRIDGE
AND BRIDGE DIGGERS
STOCKING & RECLAIMING BRIDGE
AND BRIDGE DIGGERS
WABUET SCALES
STA. 10+60
END OF SLIP
DREDGED TO EL.-40
TOP OF SLOPE
RELOADER WHARF

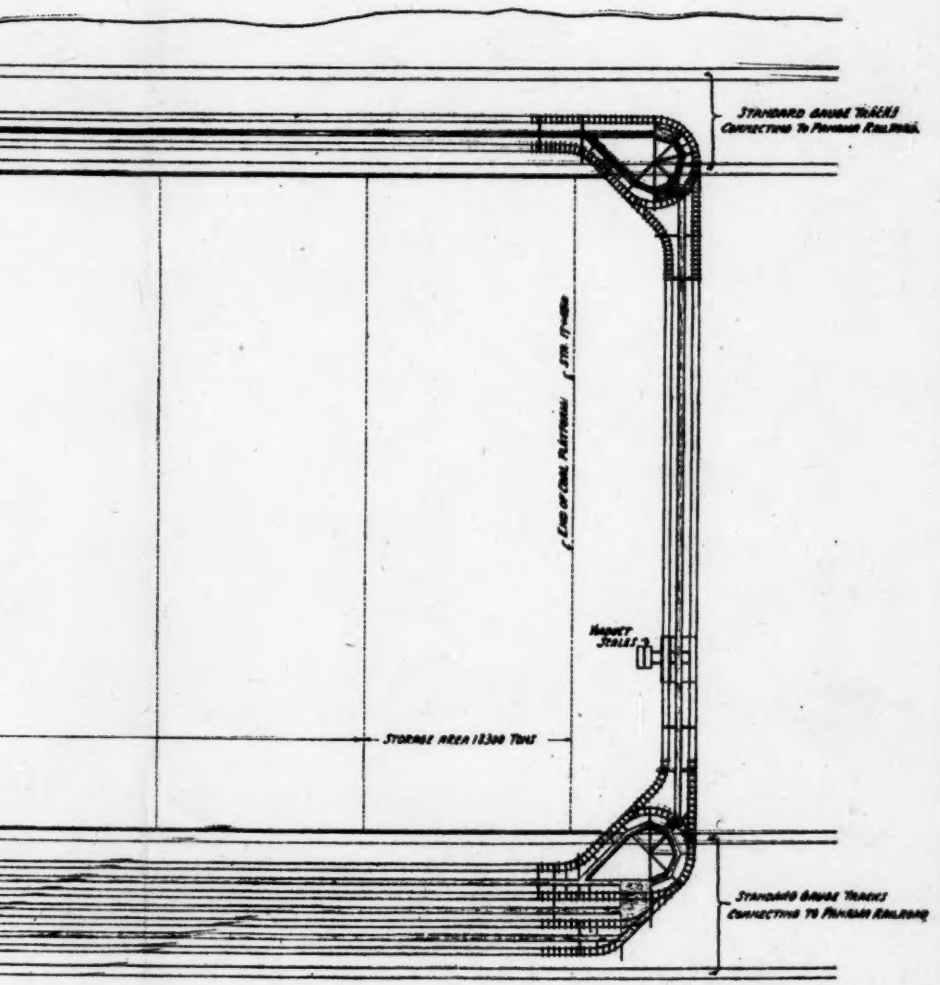

℄ Top of Slope
Standard Gauge R.R. Track Scale
℄ Trestle
11 Storage Areas, each of 17500 tons capacity, between elevations +2.0 and +32.0
Elevation of Coal Platform +2.0
Power Substation
Top of Slope

Note:—

All tons are of 2240 lbs.

The capacity of 17500 tons as given
area 100 ft. by 32, of length equal to th
the storage pile. If this area be div
equal parts, the capacity of each
it be divided into three parts, the c
two end thirds is 5270 tons each ar
third is 6460 tons.

Plate 123.



— SCALE OF FEET —

THE PANAMA CANAL

DEPARTMENT OF OPERATION AND MAINTENANCE
DIVISION OF TERMINAL CONSTRUCTION
BALBOA, CANAL ZONE

ATLANTIC TERMINALS

CRISTOBAL COALING PLANT

GENERAL PLAN

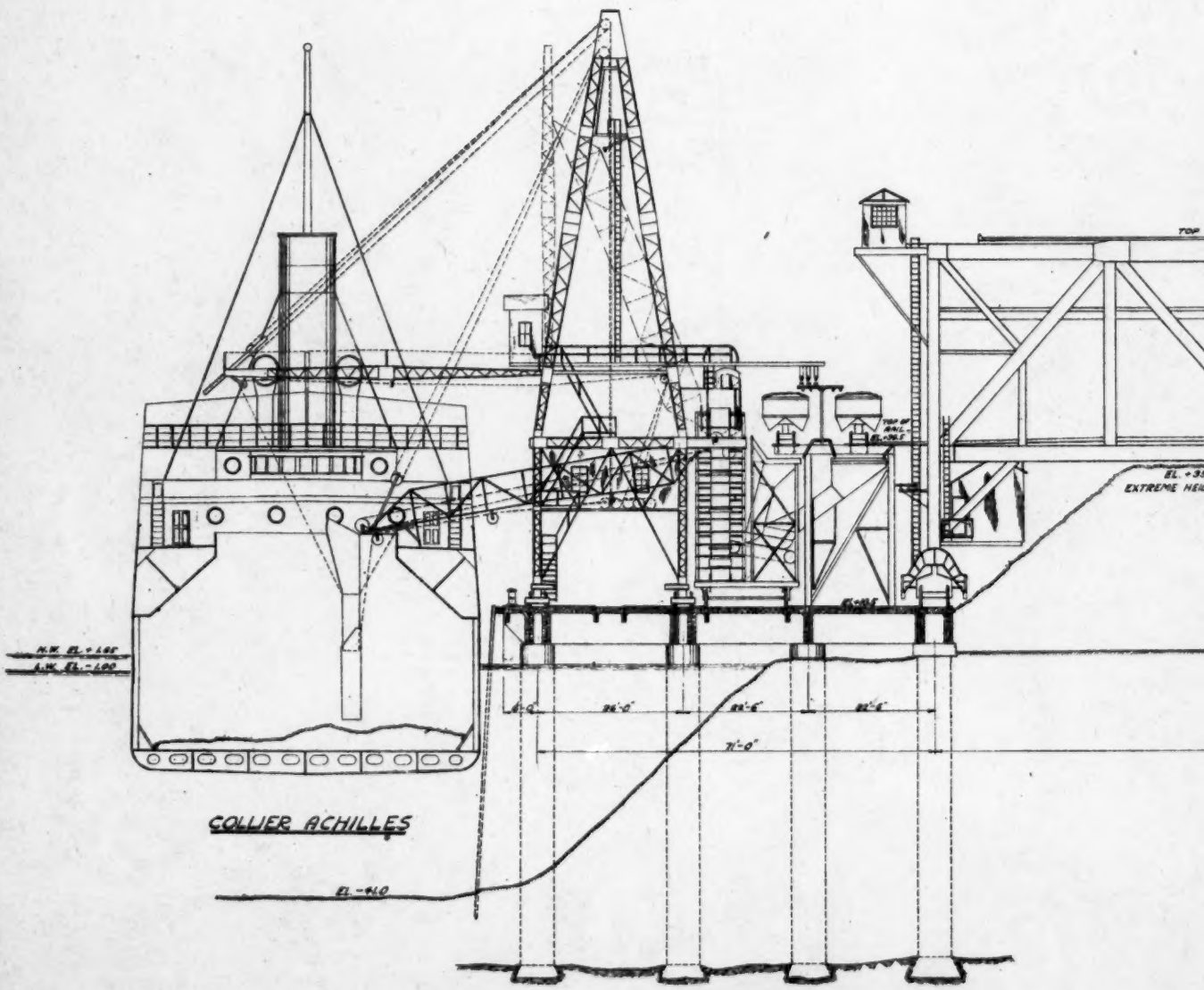
Drawn by G.J.
Traced by G.J.-E.L.R.

APPROVED: H. H. Rodney

H. H. Rousseau

THE LORD BALTIMORE PRESS, BALTO., MD.

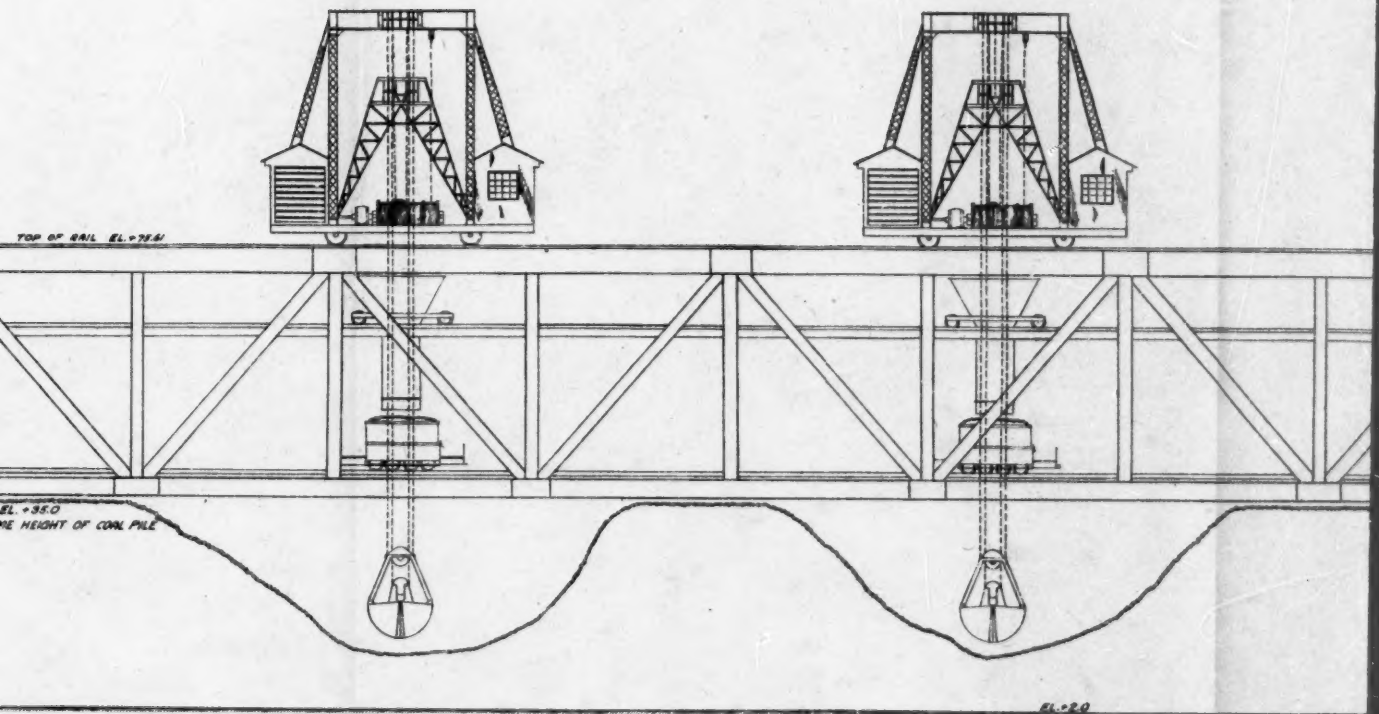
4489



COLLIER ACHILLES

RELOADER YYHARF

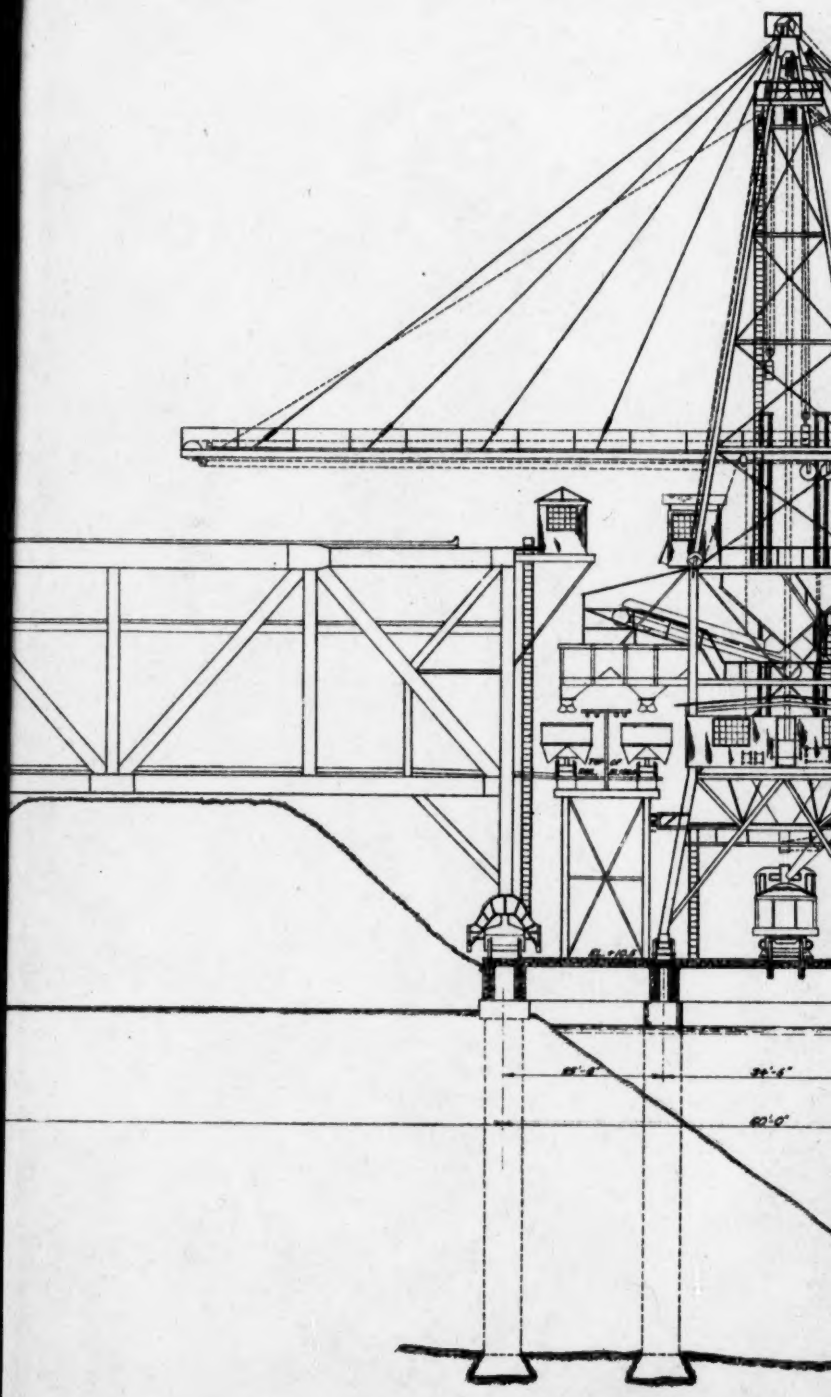
RELOADERS AND VIADUCT



315'-0"

STORAGE PILE

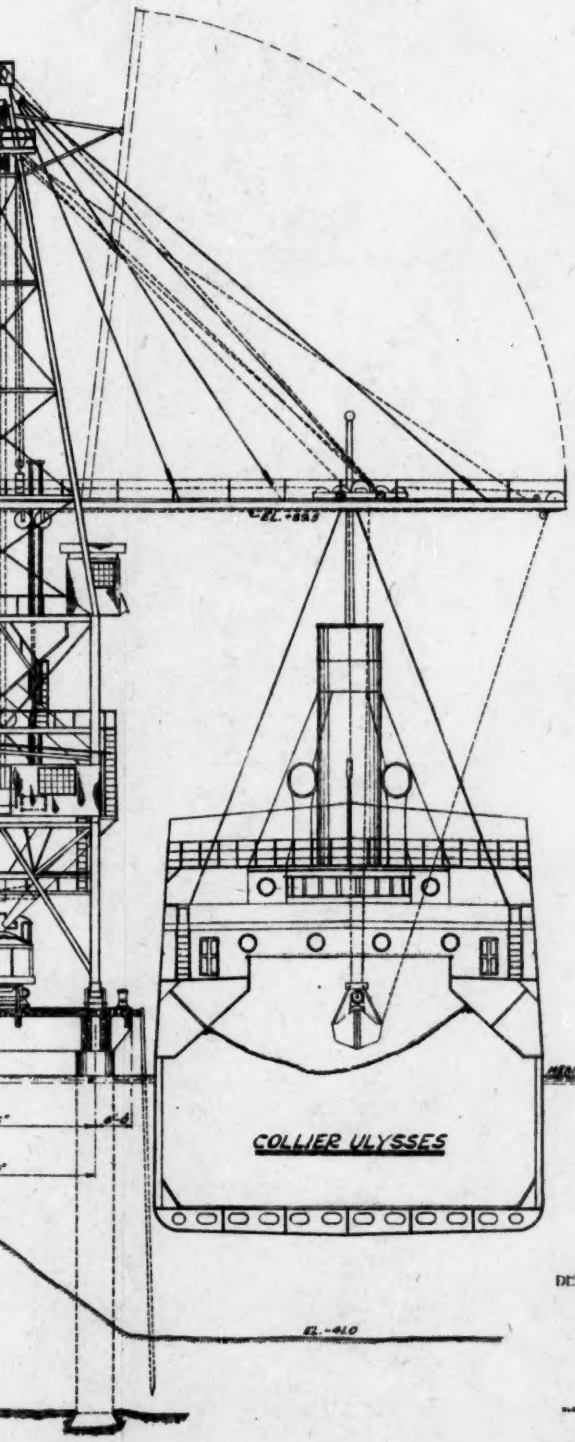
STOCKING AND RECLAIMING BRIDGES AND BRIDGE DIGGERS



UNLOADER YWHARF

VIADUCT AND UNLOADER

Plate 124.



SCALE OF FEET

THE PANAMA CANAL

DEPARTMENT OF OPERATION AND MAINTENANCE
DIVISION OF TERMINAL CONSTRUCTION
BALBOA, CANAL ZONE

ATLANTIC TERMINALS

CRISTOBAL COALING PLANT

TYPICAL CROSS SECTION

Drawn by [illegible]
Traced by J.S. - B.R.T.

Submitted
F. M. Cooke
Engineer Maintenance

Approved
Geo. W. Goethals
Chairman and Governor

Recommended
H. H. Rousseau
Engineer of Terminal Construction

The deferring of the planning and construction of the canal terminals until comparatively late in the canal construction period, and after matters of general policy and of canal requirements had rounded into definite shape, has proved advantageous, as it has permitted the symmetrical construction at one time of the entire plant, and has secured terminals which meet present needs and are readily capable of expansion to meet any future requirements.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AIDS TO EMOTIONAL INTEREST[1]

By LIEUT. COMMANDER L. A. COTTEN, U. S. Navy

Motto: . . . . "no man seeth the piston,
But it driveth the ship none the less."

Would you like to shoulder a shotgun on a crisp autumn morning, and go forth into the great out-doors and tramp for miles behind a brace of intelligent setters, over hills and valleys, through briars and stubble, until darkness drove you home tired and cold and hungry and happy? Would you care to take your place for hours in a cramped shooting-box, when the north wind cut you like a knife and the salt spray clung with icy fingers to all it touched and the ducks were flying right? Of course you would.

Would you even consider walking five miles, however fine the autumn day, to invite your most tiresome acquaintance to dine with you? Would you enjoy sitting for a few hours on the northwest corner of your veranda with the thermometer below freezing and the wind singing of its home in the north, even if you had a comfortable chair and a fur-lined coat? Certainly not. In one you are emotionally interested; in the other you are not. Therein lies the vast difference.

When Tom Sawyer had to whitewash the fence it was work, and Tom was far from pleased. The other boys arrived, and Tom succeeded in arousing their emotional interest, and for them the whitewashing became a pleasure. The results, you may recall, were threefold. The boys were given pleasure, Tom acquired several articles of value to him, and, of more importance than the other two, the *work was done*. So much for the results of emotional interest.

[1] This article was written in the autumn of 1915. Several recommendations made herein have since come to pass, but it is not considered that the main points of the argument have been altered thereby.—The Author.

In the great modern struggle for intensive efficiency in all branches of human endeavor it is widely recognized that emotional interest is one of the most powerful incentives to intelligent effort. It is perhaps not so generally recognized that emotional interest itself is the child of many and varying influences. Some of these, like the common garden flowers, are strong and sturdy and ever springing anew from the same old roots and appealing alike to the senses of all by their very familiarity and ruggedness; others are like the less hardy hothouse flowers and require more care and attention, but reward one perhaps with sensations of keener force or more subtle influence. As each flower in its own sphere adds to the joy of life, so each worthy emotional interest adds to efficiency, and everything that aids or promotes interest becomes worthy of encouragement in just so far as the object of that interest is worthy, and efficiency in it is to be desired.

In the usual walks of industrial life the most general, and, up to a certain point probably the most potent, aid to emotional interest is material interest. Thus, a man working for himself, realizes that the comfort and standard of living of himself and family is dependent upon his own efficient exertions, and emotional interest is aroused that spurs him on to both quantitative and qualitative effort. If one be an employee, the force of material interest still holds in so far as one must make sufficiently good to retain his position; and the desire for preferment in promotion in his profession or work is a forceful stimulant also. That these natural emotional stimulants are not all-sufficient can be gathered from the many profit-sharing and other interest-arousing schemes being proposed by both large and small industrial concerns. These schemes are not, as a general thing, fostered on account of an overpowering sense of justice or through any philanthropic motives, but are put forward purely that emotional interest may be created, and in this way a better standard of workmanship maintained.

One of the most attractive features of naval life is the invariability of its material recompense. While moderate, it is certain, and the ceaseless economic struggle of other lines of work, with their huge rewards and myriad failures, is happily absent. Nevertheless in the navy, as elsewhere, the quality of the finished product of work is largely influenced by the emotional interest of the workers. With us the effectiveness of work is not measured

in money or material products but in war efficiency, and consequently the workers are not interested in a material way in the output. Fortunately not all emotional interest by any means is based on material interest. In fact the highest type of emotional interest is unselfish, and not connected with the material rewards of the world. Such an interest spurs on the devout clergyman to mortify the flesh and to live a life of self-sacrifice, and sustains the keen archæologist in his wanderings and labors in the waste places where bodily comforts are not to be had. This type of emotional interest may be evolved in and of the navy, but it is not indigenous thereto, and indeed it requires assiduous cultivation and encouragement.

In discussing herein the subject of aids to emotional interest in the service the object is to point out the importance of these aids and the desirability of encouraging some of those that exist as well as introducing others. Where the term war efficiency is used it is held to include peace efficiency, for it is maintained that any duty well done in peace has its effect on the war efficiency of the individual doing it either in character, mental process or mechanical skill.

In the naval service where the desired final product of work is war efficiency, the workers, officers and men, are emotionally interested in the output only in so far as impelled by patriotism, by that interest which is inherent in anything the product of one's own hands and brains, by certain attributes of character that are developed by and fostered in the service, and by various more or less artificial emotional stimulants. The material appeal is entirely lacking and the absence of this aid to interest, which fills so large a place in ordinary life, leaves a vast field for other aids, and unless these other aids are seriously cultivated much of the field may lie barren or even be overrun with noxious weeds of extraneous interest.

In a purely material way any man of wealth or big business is more concerned with war efficiency than is the average naval officer, for the result of applied war efficiency may seriously affect the material interests of such a man. This only goes to show that wealth should cheerfully bear its proper proportion of the expense of preparing war efficiency, since it is so vitally interested in the result of its application.

Our service, alone of the large naval services of the world, is deprived of the one great aid to emotional interest that appeals through material interest, through ambition, through love of success, and through the satisfaction of feeling that one's efforts are not without direct effect upon one's degree of success in his career. This is the aid of preferential promotion, in the place of which we have that pestiferous paralyzer of emotional interest, promotion by seniority. The wails of the timid make up in volume what they lack in reason, and we continue to follow a system admirably designed to save the weaklings by restraining the more worthy—a system that would meet with almost universal derision in our own service if applied to our petty officers as it is to our commissioned officers. Officers are very prone to attribute the ills of the service to legislation while claiming all of its perfections for themselves, but the curse of an interest-stifling system of promotion is on our own heads, for even a suggestion of a change is met with a chorus of calamity howls from those who have come to look upon certain, if tardy, promotion as a vested right regardless of comparative ability or just deserts.

Even the most hidebound opponents of promotion by selection will usually admit its vitalizing force upon emotional interest in all the work that goes to make up navy life, but they are so obsessed with the fear of possible political influence upon selection that at the mere mention of preferential promotion they can see only their own terror, instead of a direct appeal to ambition, industry and efficiency, in other words, to emotional interest throughout the length and breadth of the service.

If preferential promotion, admittedly correct in principle and in successful operation in all of the other first-class navies of the world, has to be rejected by us because we are incapable of devising a just *system of applying it,* then truly we will stand convicted by our own incompetence, and will deserve no keener emotional interests than are the natural lot of gray-haired lieutenants and grandfather commanders.

The influence of patriotism as affecting emotional interest in the finished naval product is a real force, though doubtless it is but seldom consciously recognized as such, and in any case it is much more effective as a spur to supreme effort during or just prior to war than it is as an inspiration to constant and conscien-

tious labors during the dun and dreary years of peace, when efforts are prone to go both unnoticed and unrewarded.

If a life spent in the service of one's country does not of itself develop a keen form of patriotism, it would seem futile to attempt to force such a growth by artificial aids, and the handicap of its absence would have to be accepted with complacency and atoned for by such other virtues as might be available.

The emotional interest aroused in war efficiency by virtue of its being solely the result of the work of one's self and associates is not of the acute type nor is it universally felt. In any case as a driving force it is both uncertain and of variable quality. Of course, it is but natural that the better the finished product the greater the emotional interest in its creation, which in this case is equivalent to saying that unless sufficient interest has been developed in our war efficiency to make that product good, there will be but little incentive to further effort through the interest of creating such a product. However, one need not expect emotional interest to make a work good and at the same time to have emotional interest aroused by the perfection of that work, otherwise in one case or the other effect would be greater than cause.

Since one may meet his death in war by reason of his own shortcoming in war efficiency, this might be thought to act as a stimulant to emotional interest tending towards efficiency; but even if unconsciously true, it is very remote, and certainly fear is not a worthy cause even for such a desirable effect.

The consciousness of duty well done remains ever the great mental reward of the service and doubtless it has a great reaction towards arousing emotional interest in all manner of service work. The degree to which this is felt varies, of course, with persons, but without it the blight of drudgery is placed upon much of routine naval work, to say the least, and routine work is by far the greater part of service work.

Loyalty acts as an aid to emotional interest in two ways: in the desire that it creates to merit the approbation of its object, and in its unselfish interest in the success of the same. The capacity of arousing loyalty has ever been recognized as one of the greatest attributes of leadership, for the very reason that loyalty promotes efficiency through the emotional interest it creates. In so far as a leader has to depend in his juniors upon loyalty to position, rather than personal loyalty, in just so far

does he fall short of greatness. Loyalty to position is a cold and lifeless creature compared to self-sacrificing, personal loyalty that will take its possessor into the very jaws of death if need be, unthinkingly, unselfishly and cheerfully, that the greater ends of its inspiration may be accomplished. At the same time it must not be forgotten that loyalty should be reciprocal; that there should be loyalty-down as well as loyalty-up, and that nothing so effectively blasts the life of loyalty-up as for it to ascertain that what it took to be and where it had a right to expect to find loyalty-down is but self-sufficiency disguised in the cheap cloak of make-believe. As the loyalty of junior to senior stimulates the emotional interest of the former, so does the reciprocal loyalty arouse that of the latter, and the two together lead to longer sustained efforts, more harmonious work and greater achievements.

Of the truly great military and naval characters of history, the trait of reciprocal loyalty is so frequently the dominating one that its value cannot be doubted. For example we see the loyalty of Napoleon to his marshals and their undying loyalty to him, the loyalty of Nelson to his captains and theirs to him, the loyalty of Lee to his juniors and the almost super-loyalty that was his in return. Always we see the reciprocal loyalty and its association with greatness. Of course, the foundation of loyalty is moral force and from the development of this dominant attribute of military success must the springs of loyalty be fed. It may be mentioned that the influence of loyalty upon emotional interest is quite aside from and additional to its value as an essential of military character.

Naval life at its best is an abnormal life, and that keen emotional interest may be maintained in naval work, it is desirable that this abnormality be reduced as much as possible and that so much of it as is inherent and necessary be compensated for in every practicable way. The longing for home life is a natural and commendable sentiment on the part of the normal man, in and out of the navy, and, while it is never possible for those of the navy to have this longing gratified in more than limited degree, official cognizance of the longing should be taken, and likewise no possible step to gratify it in reason should be overlooked. Duty at sea should be made as attractive as possible, for it is there that the real effective war efficiency lives and moves and has its being, and happiness is its handmaid.

Sea duty in our navy differs from that in all other large navies largely by virtue of the vastly greater distances between bases of operation of the fleet, and the frequency with which these bases are changed. In the other countries a ship in the battle fleet in time of peace is based upon a certain port practically year in and year out, while we migrate almost with the regularity of the robin and the snipe, and for almost as great distances. In this connection one can but wonder what would happen to us were we required to conduct a winter campaign in northern latitudes.

It is probable that for a total of 10 months of each year our work is really division or squadron work, the remainder being devoted to strictly fleet work. It would seem to one not in the confidence of those in authority that our divisions or squadrons might be based with greater permanency and correspondingly increased happiness.

It is probable that we of the navy, along with our civilian friends, are too prone to measure our naval effectiveness in terms of dreadnoughts, great guns and torpedoes alone, rather than in terms of efficient personnel, and efficiency and happiness are intimately related. It is thought that every five years the price of a super-dreadnought might be diverted to promoting the happiness of personnel with resulting greater naval effectiveness.

In this connection our advance in recent years in the direction of the foregoing is fully recognized and the above is written only on account of the importance of continued development and because there are many who are prone to forget.

It is but natural that one should interest himself more in work into which his personality enters and in the manner of performing which he is not inordinately restricted, than in the same class of work when done by rigid rule, and when as much emphasis is placed upon form as upon substance. Hence it is that the possession and exercise of initiative, quite apart from its more direct military value, has a very decided value as a stimulant to emotional interest in naval work. This fact but emphasises the desirability of encouraging the employment and development of initiative; and, of course, without employment there can be but little development, for nothing is more effectively atrophied by non-use than initiative.

The emotional interest that we have been so far considering has to do with naval work in general rather than with particular

branches or subjects that taken all together make up naval work in its entirety. In many cases a naval subject has not within itself the faculty of arousing emotional interest commensurate with its importance; in other cases the interest-creating features are not sufficiently apparent to the general run of those who have to deal with them, and in still others these features, while present and apparent, are counterbalanced by factors that tend to stifle interest, as unusual hazards or discomfort. In all of these cases it is beneficial to introduce or encourage aids to interest, that the desired power to perceive and perform may be developed. This principle has been often recognized officially through both legislative and departmental action. Through these, certain specific forms of encouragement have become familiar and are taken as a matter of course, and the results are more apparent than the causes.

In a branch involving discomfort, as diving, the method adopted for encouraging the development of the requisite talent has been through extra compensation. In this way, by increasing material interest, the desired incentive is furnished, and the result is satisfactory and needs no further comment.

Where extra hazards are involved, as in aeronautics and submarine service, the aid to interest employed is again extra compensation. Upon casual thought this may have the appearance of appealing to the sordid side of character in an effort to develop technical skill, an expedient of more than doubtful utility, but upon deeper thought such is not the case. Hardly anyone coming under the scope of this method is free from the legitimate claims of some other person or persons, and the extra compensation is by way of being additional insurance to meet these claims, at least in part. In this way an emotional handicap to the development of technical skill is removed, and emotional interest is allowed fuller sway.

It would seem to emphasize this feature, and to place this extra compensation on a higher plane, if it were not actually paid from month to month but were held to one's credit until he had severed his connections with the extra-hazardous branch. In this way the sordid-minded might be eliminated to a greater degree from these branches, so largely made up of those of most admirable character and splendid attainments, and the desire to excel be increased in those that remain.

In certain branches in which it is thought that comparative proficiency can be ascertained, and possibly the degree of efficiency measured, the chief aid to emotional interest used in the service is competition, coupled with monetary rewards for the enlisted men. Competition is particularly associated with gunnery, and in this connection it is girt about with complicated regulations and bowed down to with worshipful homage. So long as competition can be maintained as "strife for superiority" it serves its purpose admirably, but unfortunately when administered in large and frequent doses it sometimes degenerates into merely a "desire to win," and is not free from various forms of evil trend. One naturally takes an emotional interest in matching his skill or attainments, or those of his organization, against others, but when, as so frequently happens, more emphasis is placed upon winning than upon excelling, military character is injuriously affected. A small volume might be written on the uses and abuses of competition, but it is sufficient for the service if we utilize the former and guard against the latter, and we seem to have reached a saner era of competition through a realization of this.

Even the most fanatic worshipers at the altar of competition recognize the fact that there are very important fields of naval activity in the service in which competition is not applicable, because of the lack of a standard by which may be measured degrees of proficiency. These fields cover such subjects as ability to command, moral force, leadership, and those subjects which go to make up the science of war. There are those in the service who maintain that since competition is not applicable for arousing emotional interest in these subjects they must be left like Topsy to "just grow." These officers are so possessed with the idea of the efficacy of competition as an aid to emotional interest that they overlook the possibility that there may be other aids effective in fields in which competition is not applicable.

The study of the science of war is now recognized as a very necessary part of the education of an officer, but aside from the result of such study to individuals, there is even a greater value in the wide dissemination of knowledge that will lead to a general consensus of service opinion, or school of thought, in each branch of the science of war which, taken all together, will form our doctrine of war. The sooner such a condition results the better

for the service, and we should not neglect anything wholesome that may tend to stimulate or sustain emotional interest in a subject of such vast importance.

The main sources from which emanate our development in the science of war are two—the Naval War College and the fleet. The War College is mentioned first, because time and thought are so generally taken up with routine duties in the fleet that real study of the science of war is apt to be neglected, unless one has first been reached by War College influence, not necessarily attendance. The War College should be the inspiration and the fleet the realization of development in the science of war.

It is not necessary to attempt to arouse interest in the study of the science of war on the part of those officers who are so fortunate as to be assigned to the War College, for the subject itself does that as nothing else can. It is necessary, however, to arouse greater interest in the War College itself, in order that the desire for duty there may be keenly felt by as many officers as possible. As keenness for duty at the War College develops it will be possible to pass more officers through its course each year and likewise to select these officers with greater attention to their taste, inclination and probable future usefulness—in other words, their particular fitness.

It is probable that few officers in our service realize the very high regard in which our Naval War College is held generally by the officers of foreign naval services. Recognized as a pioneer in its line and a model for others, its work is held in the highest esteem, and those are considered most fortunate who have been so lucky as to have had a course of study there. Of course, the value of the work of our War College is appreciated in our service also, by both department and individuals, but such appreciation is rather incidental, and the personal and service application of this appreciation is not always strikingly apparent.

Formerly duty at the War College was actively sought by but few officers. Now one frequently hears an officer say in effect that *if he does not succeed in getting some specific duty*, he would like duty at the War College. This is an indication of advancement, but the work of the War College is so important that the condition of interest therein should not be considered satisfactory until duty there is sought with the same degree of activity and persistency that we so frequently see it sought elsewhere.

One who has had duty at the War College almost invariably leaves there a War College enthusiast, which of itself should make others aware of the fascination, if not the importance, of the work there. This individual enthusiasm has been held to be the logical and proper way of inoculating the service with interest in War College work (the science of war), but this way is tediously slow and should be aided in every other way possible.

Since the early ages of systematic education, institutions for study in the higher branches of learning have conferred degrees upon those who successfully passed through a prescribed course, as evidence of their attainment. In science the degrees are well-known in this as in former ages. Thus there are the degrees of Bachelor of Science (B. S.) and Master of Science (M. S.), conferred by various institutions of learning in our own and other countries. These degrees carry no preferment or rights of moment with them but they are valuable and valued. Our War College is our great institution of learning so far as the science of war is concerned and it seems both right and appropriate that it be empowered by the Navy Department to confer upon its graduates the degree of Bachelor of the Science of War (B. S. W.). Further, it should be empowered to confer the degree of Master of the Science of War (M. S. W.) upon those who through subsequent work at the War College achieve something of importance pertaining to the science of war. Still further, it should have the privilege of conferring the honorary degree of Doctor of the Science of War (D. S. W.) upon those individuals, all too few, who attain to preeminent distinction in original work towards the higher development of the science of war.

There are doubtless those in the service of so prosaic a mind that they cannot see any practical value in a "degree," and for these the power of the War College to confer degrees would have no tendency to arouse emotional interest in the War College or its work, but there are many imaginative ones who would value highly the publicly acknowledged mark of approval of such an institution as our War College, in so important a subject as the science of war. These would have their interest aroused in both the War College and in its work, not only in odd days or months when they might be near or at the War College, but in

their very professional lives, and the formulation of a service doctrine of war could not be other than promoted thereby.

To the prosaic minded only the material things in life appeal. They can see no joy in the possession of faith, no pleasure in the fancies of a Carroll, and no profit in the imagination flights and emotional interests of a Bell, a Marconi or a Wright. Yet noble men have died for faith; thousands have gloried in Alice in Wonderland, and the world acknowledges the practical value of the telephone, the radio and the aeroplane.

It seems a cause for genuine regret that our War College could not confer the honorary degree of Doctor of the Science of War upon its own former president, who rose to such world-wide preeminence wherever it is acknowledged that there is such a thing as the science of war. Admiral Mahan was the recipient of honorary degrees both at home and abroad, and what could have been more fitting than for him to have received the honorary degree of Doctor of the Science of War from that institution which he proudly acknowledged as the chief source of his inspiration and which was ever the recipient of his gratitude and admiration. Surely such an action would have conferred honor upon both donor and conferee.

The opportunity of winning glory and distinction in the *art* of war comes only in war, when efforts are stimulated by all the more acute sensations of which a man is capable, and successful achievement is quickly recognized and rewarded, but constructive work in the *science* of war is a product of peace when emotional interest is prone to lag, and ultimate value is but dimly seen, if seen at all. The true foundation of the art is the science, and there seems no more logical way to stimulate interest in the latter in our service than by stimulating general interest in the War College, and for the War College to confer degrees would have a tendency in that direction, if nothing more, and the department by authorizing this would officially acknowledge the value of the study of the science of war.

In the navy the work of preparation for every eventuality is enormous and unceasing. Ashore the work is chiefly that of maintenance and supply, using both terms in their broadest sense, including personnel, ships, armament, ammunition, stores and fuel. Afloat the work has to do with the utilization of these supplies, the welding of them all into effective sea power. In

order that concentration of effort may be gotten the shore work is subdivided, each division covering a branch or branches of work requiring particular technical training, and each having for its aim the ultimate efficiency of the fleet (the navy afloat). One division, operations of the fleet, as its title indicates, is for the purpose of aiding and directing the utilization of the fleet, and necessarily it is interested in all that has to do with its efficiency, and covers certain fields of special importance in the use of the fleet in war, as plans of campaign, information and the development of the science of war.

In the fleet the commander-in-chief is responsible alike for the efficiency and the efficient utilization of his command. Of course, he is not physically able to attend to the details even of supervision except in a very general way in the various elements that enter into war efficiency, and he is allowed a staff, to the members of which are assigned the duties of supervision under him in these various fields of work. These staff officers really perform most useful duty, quite aside from that of supervision and general direction, in arousing and maintaining emotional interest in their respective branches.

Upon looking into the composition of the staff of a commander-in-chief it will be seen that, in addition to the purely administrative aids, each major subdivision of naval work is represented by an aid, except "operations." There is even an aid for athletics, but none for the science of war. Of course, the commander-in-chief is personally particularly concerned in those features of work under operations, but here as elsewhere on account of a multiplicity of duties he is not physically able to attend to the details of this work. As a matter of fact he does delegate many of these details to various members of his staff, thus getting divided responsibility, and failing to get concentration of effort.

It would seem highly desirable that at least each commander-in-chief have on his staff one member concerned solely with campaign plans, maneuvers, information, and the development of the science of war in the fleet. He should be of the rank of captain or commander and certainly next in rank to the chief of staff. He might be termed assistant chief of staff, or fleet aid for operations, but the duty and not the designation is the important part.

Of course, it is not meant that any one captain or commander, however talented, could prepare comprehensive plans of campaign, but he could do much for the execution of these plans, thus removing many details from the overloaded shoulders of his chief; he could do much in preparation for and during maneuvers; he could attend to the intelligence work in the fleet, and this means both the acquiring of information and its dissemination, and lastly he could aid and abet the development of the science of war in the fleet and arouse emotional interest therein. These things that he could do would be his primary duty, whereas now they are so apt to be looked upon as secondary by those who have to do them in addition to their other duties. The very fact that those in authority considered these subjects of sufficient importance to assign a captain or commander solely in their service could but emphasize their importance to others, with consequent development of interest and attention.

The details of the duties of such an aid as suggested can be much better determined by those in authority, but certainly one very profitable field would be in the dissemination of information. In war it is most essential that information be gotten into the hands of those to whom it may be useful—information concerning both friend and foe. In peace there is likewise much information that might be disseminated with profit.

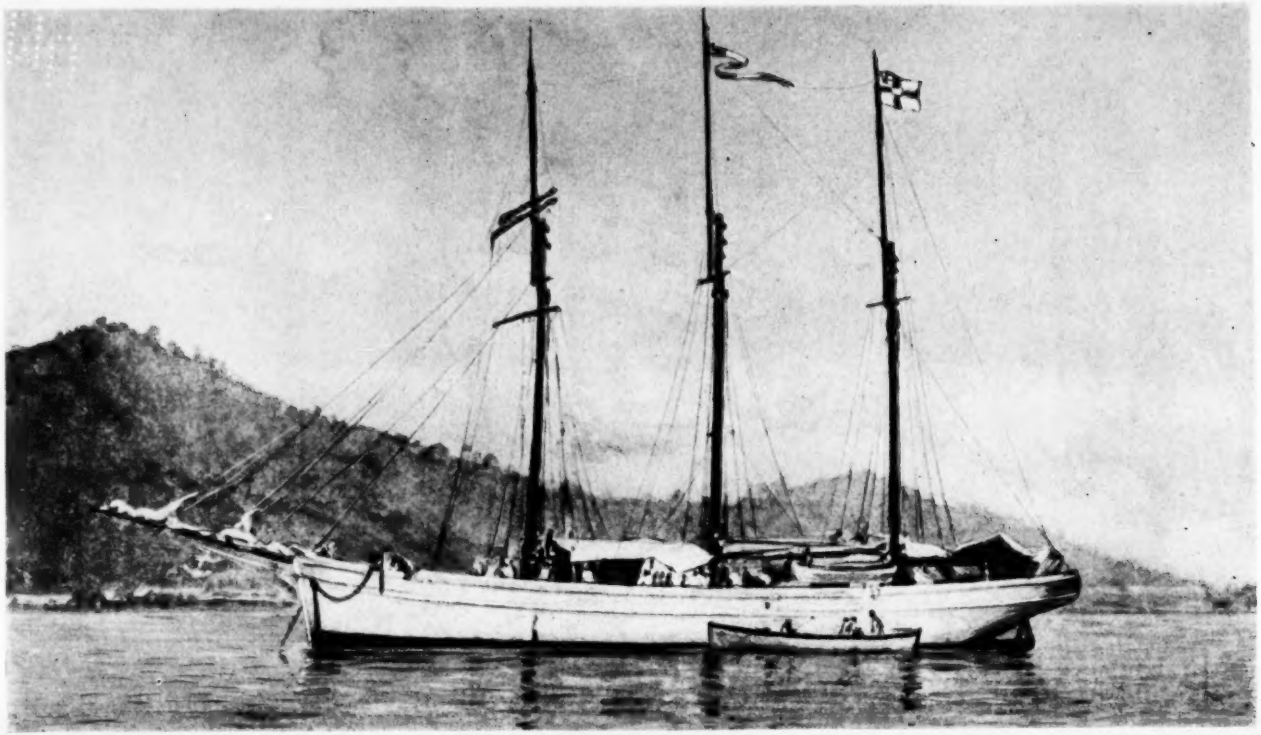
Who, during maneuvers, has not heard officers, from captains down, exclaim "What in h—l are we trying to do now?" This is not necessarily a mere exclamation of impatience, but may be a real desire for information, the lack of which in war might be fatal. It may be contended that it is entirely unnecessary that the plans of a commander-in-chief be known to more than a few senior officers in his command, but if it be expected that initiative be exercised with advantage by juniors it is essential that they know, at least in a general way, not only the plans and purposes of the commander-in-chief, but his methods as well. Furthermore, until our doctrine of war is more clearly defined, it is very important that both seniors and juniors be informed as much as possible as to both objects and methods of accomplishment in war.

As a concrete example, suppose our fleet is given the problem of preventing the landing of any enemy on our coast. The general terms of the problem are known to officers, but as to what method is to be used to prevent the landing only the select few

know. Interest in the maneuvers soon flags, and most of us are more concerned with the termination of the problem than with any of its features. If, on the contrary, it were known just what was being attempted and just what was known of the "enemy" from time to time, a much clearer conception could be had by all and interest would be maintained. Now, suppose several problems of this nature had been undertaken and then a similar real problem arose, can anyone doubt but that more perfect cooperation would be had if the entire personnel were familiar with the previous ways and methods of the commander-in-chief?

The conference for discussion is familiar to our officers now, and its value is recognized, but the information-conference is practically unknown. It would seem very beneficial if prior to grand maneuvers a member of the admiral's staff with such work as his primary duty would call a conference of officers, say in each division, and inform them of the admiral's intentions, aims and methods. Then afterwards he could do the same thing, showing where and why it was found necessary or advisable to make changes, and where the admiral would probably plan differently next time. Can anyone doubt the value or the interest of such conferences? Such a conference would concern itself not with what should be or should have been done, but with what is to be or was done. It is believed that such conferences would do much to stimulate emotional interest in the science of war as applied in our service and hasten the advent of a service doctrine of war.

In advancing any idea thought to be for the good of the service, if its utility is in any degree problematical, three ogres to progress stand ever ready to blast it with the frigid breath of condemnation—expense, necessity for legislative action, and "the pain of a new idea." The suggestions herein generally do not require money to put them into execution, they do not require legislative approval to make them effective, and it is hoped that they are not sufficiently new to cause acute pain to those who pride themselves on their conservatism. Whatever may result from what has been written, it will have entirely failed in its object if it has not demonstrated that emotional interest is the very soul of naval work. As it did for Tom Sawyer, it does for us. It produces both pleasure and profit and whitewashes our fence.



S. M. S. "AYESHA"

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AYESHA[1]

By LIEUTENANT HELLMUTH VON MÜCKE,
Imperial German Navy

Free translation by LIEUTENANT J. H. KLEIN, JR., U. S. Navy

I. KEELING ISLANDS

"I respectfully report the landing force, consisting of 3 officers, 6 petty officers and 40 men, ready to leave the ship."

It was at 6.30 a. m., on Nov. 9, 1914, that I made this report on the bridge to Commander von Mueller, commanding H. M. S. *Emden*. She lay at anchor at Port Refuge, which is the harbor built among the reefs of Keeling. Before long the two cutters contained the officers and men of the landing force. The steam launch was ready to take them in tow. The instructions that I received from the captain were to destroy the radio and cable stations on Direction Island (the most northerly of the Keeling group), and, if possible, capture and bring aboard all signal books, secret codes and other similar books.

From Direction Island there extend three cables: one to Mauritius, one to Perth in Australia, and the third to Batavia. As this station was the last link in the only straightaway cable from the home country (England) to Australia—the other cables having been previously destroyed by the other cruisers—it was reasonably certain that some attack could be expected there. Therefore, all four machine guns of the *Emden* were taken along. Two were in the steam launch, while each of the two cutters carried one. The men were armed with rifles, side-arms and revolvers. The steamer took the cutters in tow and we were off toward Direction Island.

Even small craft must navigate the inner atoll channels very cautiously in order to avoid the countless coral reefs that are

[1] *Ayesha* is not an English but an Arabian name, and is pronounced (Ah) (ee) (shah). Ayesha is the name of the favorite wife of the prophet Mohammed.

promiscuously scattered about. The course that we laid off from the ship to the landing place was approximately 3000 meters long.

Direction Island is a flat plane with high palms. Among the tops of the palms could be seen the roofs of the European houses and the wireless masts. We set our course for these. Close in toward the landing lay a small white sailing ship at anchor.

"Shall we blow her up, too?" asked my lieutenant, nodding toward the sailer.

"Certainly," said I. "She has made her last trip. Detail a man at once to get the bombs ready."

With machine guns ready for action and small arms at hand, we landed, without resistance, at a small dock and immediately took up the march toward the radio masts.

The blowing up of the white ship was postponed, because I wished to see first what preparations had been made ashore.

Quickly we captured the telegraph station building and the radio station, preventing the further sending of signals. Then I ordered an Englishman, who was following us about, to call the director. He appeared shortly. He was a very easy going and prosperous looking gentleman.

"I have orders to destroy the cable and radio stations. I warn you therefore not to resist. Above all, it is to your interest to surrender the keys to the various buildings in order to relieve me of the necessity of breaking down the doors. Deliver all the weapons in your possession. Likewise have all Europeans gather in the open square in front of the telegraph building."

The director seemed to take these orders quite peacefully. He had not thought of resisting, he said, and, reaching down in his pocket, drew forth the keys and pointed out the houses in which were kept the remaining apparatus and then left, saying, "I congratulate you."

"Hm—what for?" was my apparently eager question.

"The Iron Cross. The Reuter telegram has been sent."

We then busied ourselves with bringing down the wireless mast. The torpedo-gunners brought their explosives and first the guys were parted, and finally the mast itself was brought to earth and chopped into short lengths.

NOTE.—This story of *Ayesha* is published by permission of Ritter & Co., Boston, who hold the American copyright and by whom *Ayesha* will shortly be published in book form. J. W. G.

In the telegraph office, the Morse keys were still working. We could not read what they were sending as it was in secret code, but it amused us to see the astonished faces of the operators when they received no answers to their signals because from the operation of the signal apparatus we could see that the senders were urgently calling for confirmation and acknowledgment.

The next job was a joy to the men. Without delay a pair of heavy axes were produced and in the next instant a shower of Morse keys, ink-wells, table legs, severed cable ends and similar wreckage flew about the room. They certainly obeyed orders to do a most thorough job. High and low, search was made for reserve instruments and such, and everything which appeared to belong to the station was destroyed. Among other things, a seismograph that had been installed on the island was also wrecked. Our men thought that it was a part of the telegraphic apparatus.

The heaviest work was the hunting for and cutting of the submerged cables. A chart containing the position of the cables could not be found in the stations, but along the beach were several signs marked " Cables." Here must be the land-end of the cables. With the steam launch we searched with a pair of drags or grapnels that are ordinarily used in fishing for cables. The work was not easy as we had nothing but man-power to use and that in very cramped quarters and the cables were exceedingly heavy. It was impossible to lift them to the surface of the water, so my men, after the bight of the cable had been raised a bit, had to dive and secure tackles to them so that we could proceed with the work. After much labor we were finally able to raise the cable strands up to the boats. I was unwilling to use explosive bombs with which to cut the cables as the *Emden* needed these to sink more merchant ships. We therefore had to cut the thick cables with crowbars, axes, chisels and other similar tools. After soul-wrecking efforts we succeeded in severing two cables and towing the dead ends to sea with the steamer. The third cable, in spite of an especially thorough search, was still undiscovered.

A small, corrugated-iron house containing a mass of reserve parts and all sorts of reserve apparatus was blown up by a bomb and burned down, while the newspapers, books, Morse messages and so forth, were taken along.

The landing party was getting ready to re-embark when the *Emden* signaled, " Expedite work." Thereupon I gathered up my

men, gave up the destruction of the schooner lying in the harbor and was about to shove off when it was reported to me, "*Emden* blew her siren." According to orders this was to be the signal for returning aboard with the greatest despatch. As I got into the steamer I saw the *Emden's* anchor flag at half-mast which meant that she was weighing anchor. The harbor was strange, but that made no difference to me. I was striving to return aboard as soon as possible. At full power I raced to the ship by the shortest route regardless of the reefs. The *Emden* in the meantime headed to sea at high speed. My first thoughts were that she was going out to intercept our tender *Buresk* (that had been ordered there to coal the *Emden*) and pilot her in through the reefs, and for that reason I continued to follow the *Emden* out, but was most astonished to discover that she was going at 16 or 17 knots. The steamer, with two heavily laden cutters in tow, could not exceed 4 knots.

Shortly the *Emden* hoisted her battle-flags and the starboard broadside opened fire. Even then I did not guess what it meant and thought perhaps that the *Emden* was trying to capture a steamer which she had discovered in that vicinity.

Then a salvo of five heavy shells fell behind the *Emden*, and the five large splashes indicated the source of the firing. Now we knew that a real, earnest engagement was going on. The enemy we could not see. He was still hidden by the island and its palms. *Emden* had by now steamed several thousand meters away and was increasing the distance between us very rapidly so that I gave up all hopes of joining her. Therefore I came about.

II. "AYESHA"

We returned to the same landing. I gathered the Englishmen together again, took away all their fire-arms, hoisted the German flag over the island, according to the rights of war, forbade any attempts at communication by signals with the other islands or with enemy ships, and gave orders to my officers to prepare the beach for defense, to mount the machine guns and to stand by to dig trenches. I reasoned that the engagement of the ships would be a short one and that I would certainly have to reckon with the enemy ship which would return to inspect the station. Nevertheless I had no idea of surrendering the island, over which flew the German flag, without a struggle.

The Englishmen, slightly disturbed, came and asked permission to withdraw to another part of the island in case a fight became imminent. To which I agreed.

With two signal-boys, I withdrew to the roof of the largest house in order to observe the fight. The English were, all in all, not much concerned over the engagement of the cruisers several thousand meters from the island. They seemed to confine their interests to other things. One of them approached one of the officers who was at work on the beach and laughingly, in a friendly tone, asked " Do you play tennis? "

A question which, under prevailing conditions, seemed to us most inconceivable.

When I reached the roof, the fight between the *Emden* and the other cruiser was at its height. Both vessels were firing heavily with each broadside. I did not know the name of the enemy ship, except that due to her construction and the aforementioned salvos, I judged her to be one of the Australian cruisers *Sydney* or *Melbourne*. I thought that the enemy must be armed with 15-cm. guns because the splashes were higher and larger than those which the *Emden's* shells would make.

The *Sydney*, as I later discovered her to be, was much more heavily armed than the *Emden*. Our ship, of 3600 tons, could bring to bear five 10.5-cm. guns to a broadside, and she had no side armor. On the other hand, the *Sydney*, of 5700 tons, could bring five 15.2-cm. guns to bear on the broadside, and she had side armor. As seen on a line, the *Emden's* salvos seemed to be landing safely on the enemy cruiser, who was evidently firing very poorly, his shells landing several hundred meters apart. When he, however, succeeded in landing a salvo, the destruction on an unarmored ship was very severe.

At the very beginning of the fight the forward smokepipe of the *Emden* was brought down and lay across the ship. Another salvo, landing under the after cabin, started a fierce fire; gray clouds, caused by the lighter steam clouds mingling with the smoke, indicating that some steam-pipe must have been pierced.

Emden immediately turned short on the enemy and headed toward him at full speed, evidently with the intention of attacking him with torpedoes. While doing this her foremast went overboard. For an instant it seemed as if her adversary wished to break off the engagement as he steamed away at top speed, fol-

lowed by *Emden*. Whether he had received any severe injuries, not apparent from outside the ship, I could not make out. Perhaps also he was endeavoring to increase the range so that his superior armament could be used to better advantage. The fight drew toward the northward away from the island until finally both vessels, still fighting, were lost below the horizon.

The question now arose as to what disposition I should make of the landing force. Our ship had already received such severe punishment by the more powerful ship that it was next to impossible for her to emerge victorious and return to the island. She would probably have to arrange to slip into some harbor in order to make repairs, bury the dead and transport the wounded ashore. I could, however, safely assume that in a short time some English warship would proceed to Keeling to see what was happening to the radio and cable stations. The telegraphic communications were broken between the Australian ports and also between Batavia and Mauretius.

We could, with our 4 machine guns and 29 rifles, repulse a landing force of Englishmen, but we were powerless against the gunfire which the English cruiser would pour on us. All in all, it seemed but a postponement of the inevitable surrender of a post whose loss was, without doubt, a foregone conclusion. Captivity in English hands was not to our taste.

There still lay in the harbor the small, white schooner, fortunately not as yet blown up. It could and would help us out. I decided to leave the island on it. The name was *Ayesha* and it had formerly made two or three trips each year to Batavia, carrying copra away and returning with provisions. Now, however, as steamships made regular calls here, the schooner lay in the harbor unrigged, out of service and rotting away.

I went to her alone in the steam launch in order to look her over and determine her seaworthiness. The captain and one seaman were aboard. At first, in an offhand way, I asked him if he had any munitions aboard, as I did not wish him to guess the reason for my coming aboard. He denied having any, and while showing me casually about the ship, I concluded that she apparently was still seaworthy. Therefore I sent my officers and men to the *Ayesha* to prepare her for sea. And there was a lot to be done. All sails and rigging had been removed and stored and these had to be found and brought aboard.

As the English discovered my intention of leaving the island in the schooner, they warned me most carefully. The *Ayesha* was old and rotten and could not keep the sea. Also, they advised me that the English man-of-war *Minotaur* and a Japanese cruiser were near the island and that they thought that capture by them was certain. Also, my predecessor on the *Ayesha,* as he left the ship, said goodbye with the following words: " I wish you a *lucky* cruise, but the vessel's bottom is full of holes."

Inasmuch as we continued to prepare the *Ayesha* for sea. despite all their warnings, the English finally saw the sporting chance we were taking and then ran their legs off to assist us. I leave it to you to judge whether it was gratitude that drove them to be of assistance. Previously several of them had expressed their delight to me at the destruction of the cable service, as the many hours of extra work and the scarcity of reliefs were now at an end once and for all. They showed us where to find provisions and water, advising us to take provisions from this side only as they were new and fresh while those on the other side were old; they brought cooking utensils, water, casks of oil, old wearing apparel, bedclothes and similar most necessary stuff. Invitations to luncheon poured in from all sides. They gave pipes and tobacco to my men. In short, the English did everything they could to help us out. They did not deceive me in regard to courses and, as I later discovered, all their information in regard to wind, weather, currents, etc., was substantially correct. As the last boat left the beach they gave three cheers, wished us a pleasant voyage and thanked us profusely for the " moderation " which we employed in carrying out our task, in which all the people " generously " joined. Then they swarmed about the ship for a time taking photographs of the *Ayesha.*

In the meantime, the lookout reported that the two engaged ships were again in sight. From the *Ayesha's* masthead I could see only the heavy, black smoke clouds of the *Sydney,* then the masts. smokepipes and superstructure gradually came in sight. On the *Emden* I could see only one smokepipe and one mast. The remainder of the ship was still under the horizon. Both cruisers were steering easterly courses. The firing was still going on.

Finally the *Sydney* shot out at high speed toward the *Emden.* I had the feeling that the *Emden* had made her last stand and that the *Sydney* was approaching to administer the final death blow.

Then there showed between the foremast and the forward smoke-pipe in the black smoke of the Englishman a high, white water-spout that could only have been caused by a heavy explosion. We assumed it to be a hit by one of the *Emden's* torpedoes. The *Sydney,* still at least 20 sea-miles away, turned hard to starboard and, on the opposite course, steered slowly to the westward, the *Emden* continuing on her easterly course. Both vessels still continued firing. The range became greater and greater until at last it exceeded the range of the guns. The engagement ceased, both ships disappearing beneath the horizon in the approaching darkness. That was the last I could observe. The fight started at about 8.30 a. m. and lasted until about 6 p. m. The story published in all the English newspapers that it was a "60-minute running fight" should be classed with the numerous other false English reports.[1]

The coming of darkness then made it necessary for me to slip from the harbor. In the dark it is absolutely impossible to leave the harbor and navigate safely among the many coral reefs. We had in the meantime taken aboard enough water to last about four weeks and sufficient provisions for eight weeks. The sails were, of course, made ready for use. I gave the crew a short talk, and then to the accompaniment of three cheers to the bravest of the war's heroes we hoisted the battle-flag and pennant on the latest acquisition to the navy, His Majesty's Ship *Ayesha.* The steam launch slowly towed us ahead. I took station in the foretop because, as we had no reliable charts, from there the reefs and channels could best be seen. With my battery whistle I gave orders to the towing steamer, telling them to avoid the reefs by steering to port or to starboard. The two *Emden* cutters I took in tow.

The trip out was very slow indeed for us. The sun was already setting and in the tropics there is no twilight. As soon as the sun disappears beneath the horizon, complete darkness reigns. We had not quite finished the dangerous passage among the reefs before it became too dark for me to make out the channel from my position on the foremast. Therefore I took station in the port chains close to the water's edge and directed the operations from there.

[1] The report of Captain Glossop, of the *Sydney,* appears on pp. 264-5 of PROCEEDINGS No. 155.

Just as we were passing the last reef which could possibly be dangerous, we received a bad scare. In spite of the darkness I could clearly see each stone, each blade of grass on the bottom, a sign that we were in shallow water. Our stern, however, went over the shoals without grounding.

In the interim we set several sail in order to lighten the heavy tow work of the launch. Soon we were clear of the protecting islands and, on the bosom of the ocean, our craft received a new motion, the heavy, long swell of the sea.

When we had proceeded sufficiently well out to be free to cruise without danger of the breakers, I recalled the steamer alongside in order to muster the crew. The high swells made this maneuver not an easy one. The steamer was constantly surging against the guard-rail of the *Ayesha,* and although I now seemed indifferent to the fate of the steamer, I still had many scruples against this unintentional duel between my new and my old ship. I doubted if the *Ayesha* could stand these friendly attentions very long, so it finally became expedient to cast off the steamer and the last man opened the throttle to use up the remaining steam in the boiler before he jumped aboard. With a boat-hook, we, on the *Ayesha,* put her rudder to port. In an elegant curve she drew away and was lost in the darkness. Where she wound up, I know not. Probably she found her grave in the breakers, roaring a few hundred meters away. Perhaps, also, she is still cruising on the ocean, carrying on a war of privateering.

III. On Board

The next day we proceeded to inspect more minutely our new home. The *Ayesha* was a ship of 97 tons gross, as we discovered by reading a sign on one of the beams in the storeroom. She was about 30 meters long and approximately 7 to 8 meters beam. The ship was fitted with three masts, the two after ones, that is, main and mizzen, were schooner-rigged, while the fore carried two square sails. Evidently she had been manned by a crew of five seamen and the captain, while we now had 50 aboard. The men were quartered in the crew's space forward. But as the forecastle could not accommodate more than six men, the remainder slept in the storeroom.

When we took her she had no cargo aboard, but she did have some iron ballast. It was not a pleasant job to fit out the crew

for sleeping, as it had only been possible to bring along from Keeling a very small quantity of bedclothes and mattresses, and the men had to sleep on the spare canvas (sails) on top of the iron ballast. Step by step they gradually increased the comforts of their quarters. They speedily proceeded to make hammocks out of old ropes, binding twine, tattered scraps of sail and such material. These were then hung wherever there was room and thereby offered the possessors a refuge from the heavy rolling of the ship.

In the after storeroom were two small cabins under the deck which had been fitted out with sleeping accommodations, but were used by us as provision storerooms, as we could see that the innumerable cockroaches would make life unbearable. Way aft was still another small room which, from a sign over the door, we knew to be the navigation room. In this the petty officers quartered themselves.

On deck I found a small deck-house of two rooms, but only one bed. In one of these I lived; the other was shared by my two lieutenants. Finally, there was still another exceedingly small room that held a table and a couple of small benches. This we used as a messroom, as an office for the officer of the deck, as chart room, smoking room, lounging room, saloon, etc.

Several difficulties were found with the equipment on board. The canned provisions brought along from Keeling made very choice food, but the galley (that is, the ship's kitchen) was of course built to serve five men, and the dwarf stove therein was not of much use to us. Fresh water could not be used for cooking because it had to be conserved for drinking purposes only. We increased our capacity for cooking by tearing off promiscuously distributed pieces of sheet iron, laying them around the stove, and placing chunks of iron ballast, brought from the storeroom, on the sheet iron until we had a fire-proof foundation on which to start a fire. The men sat in circles holding their cooking utensils by the handles over the fire until the food was cooked. It was impossible to set a large pot over the fire because of the heavy rolling of the ship.

Cooking was done with salt water. The arrangements were placed entirely in the hands of the cook. The food aboard the *Ayesha* was not bad, consisting mainly of rice, fruit, ham, corned beef and such other provisions.

The question of drinking water was more important. There were four small, iron, fresh-water tanks aboard, constructed for the supply of the aforementioned crew of five men. When preparing the *Ayesha* for sea, we had no time to examine these carefully. We had to fill them as quickly as possible. Having used but from one tank, it was several days before we noticed that the other three tanks had become foul. The water was not drinkable. The assortment of Selters water that was brought from Keeling was to be used only as a last resort, because I had to plan to abandon ship in the two *Emden* cutters which I still carried, in case of accident to the *Ayesha*, of whose seagoing qualities I had not as yet been thoroughly convinced. In such a case the only way to carry water would be in the Selters bottles. We hoped at some future time to replenish our foul tanks with rain-water. And even this hope did not fail us. On the 13th of November, that is, four days out at sea, the first of the tropical rains came on. We had cleaned out our three bad tanks and rigged up an old sail as a rain sail. It was secured horizontally across the loading hatch. A hole was made in the middle of the sail and a man stood beneath the hole with a petroleum tin—that is, one of the containers in which the Standard Oil Company ships its petroleum—and caught the water as it dripped down through the hole in the sail. The full tins were then passed down the line of men to the tanks. In addition the cabin roof was also rigged to catch the rain. On the sides were small rails and the water which gradually filled the roof ran down two small drainpipes into the petroleum tins that we had hung up beneath them. The rain-water was drinkable, especially when we added a little lime juice (lime juice is a sour-tasting essence). We found a few flasks of it (lime juice) among the provisions of the former captain.

As the tropical rains came almost regularly morning and evening from now on, we soon had our tanks full of water. Also all possible water-bearing receptacles and petroleum tins were filled with water. In other directions the rain also came in handy. As the sweet water had, of necessity, to be saved for drinking purposes, we were in a bad way about washing. Soap will not make a lather in salt water, nor does salt water alone make one clean. We used the showers, therefore, to give ourselves a good sousing and washing. They became regular shower baths. We closed up the scuppers with old rags and such to prevent the water from

flowing overboard. The water accumulated on deck, and washing from side to side as the ship rolled, together with the constantly falling clean water from above, gave us the finest baths imaginable.

The *Ayesha* carried two small boats. One held barely two men while the other, a larger one, not more than three men. They swung in davits abreast the cabin. These boats were also used to gather water in that the hole in the bottom was carefully closed by the plug. Even though the water, caught by this method, was not drinkable as we had hoped, due to the strong salty taste, it was not too salty to be sued for washing purposes.

The crew was divided into two watches, the starboard and the port watch. Most of my men had naturally seen service on a sailing ship and were familiar with the duties and rigging, but the firemen had never been in a position to be detailed to duties aboard sail craft. I had, however, so many erstwhile fishermen and sailing ship seamen in my complement that I could handle the ship in safety. When it became necessary to use all hands on deck in order to carry out any evolution, there was much strength available.

The rigging gave us our next great care. A large part of the sails were old and weak, ripping constantly, so that we were forever busy with patching and mending. Often the shrouds themselves carried away. Therefore we had to watch the weather signs very carefully as we had no idea how much of a blow the masts would stand. Considered as a ship the *Ayesha* inspired little confidence. The captain's words as he left the ship in Keeling, "The bottom is full of holes," seemed to be correct. In the storerooms, as we scratched the planking with a knife, we discovered how decayed and rotten the wood was, so we quickly desisted from scratching for fear of sticking the tip of the blade into the Indian Ocean.

The first day we had a following sea and the *Emden's* cutters towing at the end of a long line did some wild dancing; while doing this one of the cutters rammed the overhanging stern of the ship and carried away the so-called mirror. (Note: The mirror is that part of the stern where the name or coat-of-arms is attached.) One of these scuffles between the boat and the ship itself resulted to the disadvantage of the former. The bow of the boat struck the rotten wood of the mirror a powerful blow and broke a plank just above the water line. I was not, however,

disposed to chance a repetition of such a catastrophe, so I cast the ill-behaved cutter adrift and kept but one, which deported itself in a more gentlemanly way. But this precaution was not effective very long. I do not know whether it was, or was not, due to the example set by his brother whom I cast adrift, but in one of the next few nights he also disappeared, taking with him a piece of my rail to which he had been secured. The place where the rail carried away (evidently pulled out a cleat) showed how decayed and rotten the wood was.

In the first days the *Ayesha* filled up with water. In a very short time we had so much in the ship that it covered the iron ballast on which the men were sleeping. While endeavoring to work the ship's pump we discovered that it was broken. There was no piston packing. We took the pump apart, disconnected the pistons, and replaced the absent rubber packing with trouser rags soaked in fat, so that we could again start pumping out the ship. All in all the picture of the *Ayesha* classed as a seagoing ship was pretty sad. If we had had to receive a visitor at sea he would probably have been quite astounded at the paradise condition in which we were as regards clothing, for aside from the occasions on which the rainfall furnished us with baths, when we wore nothing at all, even at other times our clothing was quite scanty. Prior to landing at Keeling we dressed as lightly as possible, and I also directed that only the oldest clothes should be worn. Now, during the long continued sailing and due to the strenuous labor on board, the goods rapidly went to pieces. Means for bettering this condition were not at hand, as we had neither needles nor thread. True, we had brought along some old garments from the English at Keeling, but these served more as amusements than as regular clothing. I had the impression that the average Englishman was a tall and slender person. Whether that is true or not in Keeling I do not know, but these trousers came up to the calves of my men's legs, while the blouses and jackets were sufficiently large for any two men.

IV. A FINE DAY ABOARD

About 6 a. m., at sunrise, the crew got up. Aboard men-of-war, reveille is usually sounded by seamen petty officers with pipes, so-called boatswain mates, who give three long, shrill whistles as a signal for all hands to turn out and lash hammocks. We tried

the experiment of omitting this detail because we had but one boatswain's mate aboard and we could not count on his being on watch daily at this time. The men slept close together packed like sardines; it therefore became necessary to awaken only one man in order to get them all up, as he disturbed his neighbor who in turn passed the disturbance on from man to man.

After rising, each man washed up, utilizing the rain-water in one of the small boats, left over from the previous night. When times came when we could not wash we did not let that bother us; because our deportment otherwise harmonized with our condition, in that we of course had no tooth-brushes. Much attention was bestowed, however, on the hair which grew longer and longer. The single comb traveled from hand to hand, your neighbor acted as your mirror, and the water with which to wet your hair was very select salt water. For the "dandies" we even had a shaving kit, the rusty razor carving up their faces in all sorts of ways.

Then we turned to on cleaning up the ship. With buckets we drew water from over the side and sprinkled the decks. One gang would turn to and pump out the water which had come in overnight. The old sailor men were examining the rigging to see what had again carried away, and then repaired it. The cook, with his chosen confidants, sat around the galley preparing breakfast. It usually consisted of rice with tea and coffee. Then there evidently seemed little more for the crew to do. Drills could not be held due to the lack of space. We sometimes passed the time away by instructing the staff-detailed men and the firemen in the secrets of steering, compasses, and the service, etc., of the rigging of a sailing ship. Frequently the men were shown the chart, the only one aboard, and the position of the ship explained to them. Plans were laid for the future.

Speaking of charts, we had, outside of the special chart of Batavia to which we would not go, one chart embracing half the world, made out on a ridiculously small scale. It reached from Hong Kong and Borneo in the East to Suez, Zanzibar and Mozambique in the West. The journey, some 700 sea-miles, to Padang where I wished to go, was, on this card, about as large as the breadth of your hand.

In the meantime it soon became noon and time for the noon meal. As we had not enough plates, forks, etc., to go around.

the crew had to eat by sections. The individual portions were dished out by the cook under the supervision of the petty officers. In addition to the food at noon, each man received a cup of coffee or tea. In order to break the monotony of a long afternoon, the meal was drawn out as long as possible and at its conclusion we took a nap. The separation of officers and men as practiced on large ships was here naturally wholly out of the question. The deck space was merely sufficient to permit all hands to lie down comfortably on the main deck.

Soon they formed groups that favored certain places to loaf. There they sat or lay down, smoking or sleeping; or were considering themselves fortunate to be in line waiting for their turn to use one of the few decks of cards that we succeeded in digging up in Keeling. Others turned to fishing. All along the rail hung fishing lines lying in wait for the fish. To the best of my knowledge we did not catch a single one. Should that be blamed on the fact that fish do not bite on rice, our only bait? Many times were the old reminiscences retold, while picture puzzles, number tricks and foolish questions made their regular rounds.

In the evenings after supper, when the sun had set, the men would gather up forward and sing. As we had some good singers, the chords of the quartets were right musical, and, as usual when the Germans are in a good mood, " Loreley " and such other tragic songs are the favorites. In passing, I will not say that " Puppchen " (Doll) and " Das Lied von der Reeperbahn " (The Song of the Ropewalk) were forgotten.

We did not set a definite time for turning in. Each turned in when he pleased and the men on watch, that is, the lookout forward and the helmsman aft, saw to it themselves that they were properly relieved on time. We carried no lights at night. We had very little petroleum aboard, and the two petroleum lamps ready at hand made more smoke than light.

V. A RESTLESS DAY

But not all days passed by as comfortably as the one previously described. Frequently we battled with storms and rain squalls. Particularly was this true each morning and evening. Although the bad weather was pleasant in that it provided us with water, it nevertheless worried us because of the danger to ship and rig-

ging. Luckily the storms and squalls can be seen, in the tropics, a long distance off and their approach can be clearly gauged.

On the horizon could be seen irregular, individual black clouds, and the rain could be seen as long and wide dark stripes. As the clouds floated higher, the rain would draw distinctly closer. When the storm approached within about a thousand meters, the sails were reefed as much as necessary and the storm ridden out. We lay this way close-reefed, only sufficient small sails set to keep her head into the wind, until the storm passed by, accompanied by such a heavy downpour that it was impossible to see anything but the closest objects.

One day we had a particularly heavy storm. The clouds flew so low that it almost seemed possible to reach up into them. The wind came up as we supposed, and, as we set to work to shorten sail, the squall struck us. It took the mizzen topsail and whipped it madly through the air a few times.

The men on deck could not hold on; the sail flew over the mizzen gaff, held fast there, and finally tore and remained hanging. Repairs were impossible, due to the heavy rolling of the ship. The whipping sail endangered the whole top, especially the topmast, that is, the thin upper part of the mast, which is very poorly supported. It went through some hair-raising gyrations. It happened in the heaviest part of the squall when everybody had his hands full tending the other sails. Finally we managed to get in all sail except a few small rags that had to be set to keep headway or steerageway on the ship.

The clouds were so thick that it grew dark as night. Earsplitting, shrill lightning flashes and heavy thunder followed. They were so near and so bright that they blinded one, making it impossible to see for a few seconds.

The heavy wind finally left the storm center and it became perfectly calm in the air. But the sea and swell kept running. When the masts lost the steady pressure of the wind she pitched about so wildly that we were afraid the masts would go by the board without our being able to do anything to prevent it. The air was charged with electricity, and St. Elmo's fire burned a foot high at each mast head.

Gradually the storm passed by. After several short but strong puffs of another squall, quiet weather set in and only the distant visible signs reminded us of the several bad hours we had recently

passed through. Quickly we set all sail and proceeded. Soon thereafter a steady wind set in again.

At those times when there was absolutely no wind, the heavy swell of the high seas caused extraordinarily heavy pitching and rolling. The sails by now had very little support left, and as the yards and booms swung across the ship from side to side the masts and the whole ship trembled. On those occasions we were therefore forced to secure all sails and gear so as to prevent damage to the ship and its rigging.

Life on board was, therefore, because of the jerky motion, very uncomfortable and tiresome, for one had to stand holding on securely with both hands, or else wedge himself in some safe corner, in order to live. Also at these times we had to secure all sail.

One day while so disposed and while attempting to prevent our souls from jumping out of our bodies, a smoke cloud was reported on the port hand. As we were well off the beaten steamer tracks it could only mean that it was a ship likewise avoiding the regular steamer paths. Then we thought that it might be either the *Exford* or the *Buresk,* the colliers which the *Emden* had left at certain localities before the Keeling engagement, and that these colliers, not having heard further from the *Emden,* were also seeking to reach Padang and receive further information. Again, it might be some enemy cruiser which had been to Keeling, heard of our departure, and was now seeking us.

Now, when leaving Keeling, we had only three courses open to us: to Batavia, to Padang, or to Africa. The most evident (to the enemy) was either Batavia or Padang. For a fast cruiser it would be an easy matter to search both tracks because he could, while we were delayed by weather, have laid down on the chart our probable courses and guessed at where we would most probably have arrived at a certain time.

All signs were investigated in endeavoring to determine the character of the ship. From the masthead we could see only the smoke. Any attempt to evade her with the *Ayesha* was impossible, as, without wind, we had no motive power. After several uncomfortable hours the smoke cloud disappeared.

Meantime the evening breezes came up, and with them the usual rain showers. To-day we received an unusual surprise. We found ourselves in the neighborhood where the southeast and northwest

monsoons meet and fight for supremacy. Every instant the wind shifted. Soon a squall blew up from forward, and then came another from aft—a circumstance that called for the most delicate and special skill in the handling of the sails. We had practiced the shifting of sail several times before, but we were now given a job in which at first we had no idea what should be done. A heavy rain cloud from forward (to the northward) approached the ship simultaneously with one from aft (to the southward). Evidently we had to set the foresails for the storm from forward, and the sails aft in such a way as to ride out the storm approaching from the south. The two showers that accompanied the storms could not have been excelled by the shifting shower baths of the most modern sanatorium. The northern storm brought water that was so icy cold that the majority of us withdrew below deck; a moment later, the southern storm showered us with tepid, warm water.

[TO BE CONTINUED]

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A PERSONNEL RESERVE FOR THE NAVAL SERVICE

By REAR ADMIRAL A. C. DILLINGHAM, U. S. Navy (retired)

A personnel reserve for the navy is a very important factor in preparedness. We have made speeches and written articles and had discussions in favor of preparedness, hoping thereby to create a great national sentiment in favor of preparedness. In this effort we have been successful; the sentiment has been created and exists to-day. We may continue to make speeches, write essays and articles till the next war comes on, and finds us unprepared, unless we use the sentiment to compel the creation of forces necessary in preparedness. As I say, the sentiment for preparedness is a fact and has given us a law creating a "Personnel Reserve for the Navy," hence it would seem useless or unnecessary to continue to write articles upon this subject. The practical necessity now is to make the best of the law by educating the men we expect to enroll, in the features of the law, and have them if possible realize their obligations as citizens, to serve.

The Navy Department has framed a bill expanding the powers of Chief of Naval Operations, and giving him the necessary number of assistants for the proper military administration of the fleet. The sentiment for preparedness has been of use in having this bill become a law. The Bureau of Navigation, after careful and mature deliberation and study, has framed a bill, approved by the Navy Department, for the creation of a "Personnel Reserve for the Navy," the same sentiment for preparedness has had its effect and the bill has become a law, and we now have the means of creating such a reserve. The best essay that could be written with the suggested title as a text is found in the law itself, and the best exposition of the necessity for, and the reason why there should be a "Personnel Reserve for the Navy" is set forth in the report from the committee having the bill in

charge by Senator Swanson, of Virginia. Our business, the business of naval officers in the premises, is to make a thorough study of the law and the report, give it time to work and get results, and to do everything possible to help it along. If it is found that the law can be improved upon, put our suggestions in writing and forward them to the Chief of Naval Operations, who no doubt will send them to the Bureau of Navigation, where they may be of service.

The bill creating a personnel reserve for the navy and the report on this bill are as follows:

NAVAL RESERVE FORCE

There is hereby established, under the Department of the Navy, a Naval Reserve Force, to consist of six classes, designated as follows and as hereinafter described:

First. The Fleet Naval Reserve.
Second. The Naval Reserve.
Third. The Naval Auxiliary Reserve.
Fourth. The Naval Coast Defense Reserve.
Fifth. The Volunteer Naval Reserve.
Sixth. Naval Reserve Flying Corps.

The Naval Reserve Force shall be composed of citizens of the United States who, by enrolling under regulations prescribed by the Secretary of the Navy *or by transfer thereto as in this Act provided,* obligate themselves to serve in the Navy in time of war or during the existence of a national emergency, declared by the President: *Provided,* That citizens of the insular possessions of the United States may enroll in the naval auxiliary reserve.

The Secretary of the Navy shall make all necessary and proper regulations not inconsistent with law, for the administration of the provisions of this Act which relate to the Naval Reserve Force.

Members of the Naval Reserve Force may be *ordered* into *active service in the Navy* by the President in time of war or when, in his opinion, a national emergency exists.

There shall be allowed in the Naval Reserve Force the various ratings, grades, and ranks, not above the rank of lieutenant commander, corresponding to those in the Navy. Officers of the line may be appointed for deck or engineering duties, as they may elect.

Members of the Naval Reserve Force appointed to commissioned grades shall be commissioned by the President alone, and members of such force appointed to warrant grades shall be warranted by the Secretary of the Navy: Provided, That officers so warranted or commissioned shall not be deprived of the retainer pay, allowances, or gratuities to which they would otherwise be entitled. Officers of the Naval Reserve Force shall rank with but after officers of corresponding rank in the Navy.

Enrollment and reenrollment shall be for terms of four years, but members shall in time of peace, when no national emergency exists, be discharged upon their own request upon reimbursing the Government for any clothing gratuity that may have been furnished them during their current enrollment.

Persons enrolling shall be required to take the oath of allegiance to the United States.

When first enrolled members of the Naval Reserve Force, except those in the Fleet Naval Reserve, shall be given a provisional *grade,* rank, or rating in accordance with their qualifications determined by examination. They may thereafter, upon application, be assigned to active service in the Navy for such periods of instruction and training as may enable them to qualify for and be confirmed in such *grade,* rank, or rating.

No member shall be confirmed in his provisional *grade,* rank, or rating until he shall have performed the minimum amount of active service required for the class in which he is enrolled, nor until he has duly qualified by examination for such rank or rating under regulations prescribed by the Secretary of the Navy.

No person shall be appointed or commissioned as an officer in any rank in any class of the Naval Reserve Force, or promoted to a higher rank therein, unless he shall have been examined and recommended for such appointment, commission, or promotion by a board of three naval officers not below the rank of lieutenant commander, nor until he shall have been found physically qualified by a board of medical officers to perform the duties required in time of war, except that former officers and midshipmen of the Navy, who shall have left the service under honorable conditions *and who shall have enrolled in the Naval Reserve Force,* may be appointed in the *grade and* rank last held by them without examination other than *the* physical examination *above prescribed.*

The retainer pay of all members of the Naval Reserve Force, except the Volunteer Naval Reserve, while enrolled in a provisional rank or rating, and until such time as they shall have been confirmed in such rank or rating, shall be $12 per annum. Thereafter, the retainer pay shall be that prescribed for members in the various classes.

Retainer pay shall be in addition to any pay to which a member may be entitled by reason of active service.

Retainer pay shall only be paid to members of the Naval Reserve Force upon their making such reports concerning their movements and occupations as may be required by the Secretary of the Navy.

Members of the Naval Reserve Force who reenroll for a term of four years within four months from the date of the termination of their last term of enrollment, and who shall have performed the minimum amount of active service required during the preceding term of enrollment, shall, for each such reenrollment, receive an increase of twenty-five per centum of their base retainer pay: *Provided,* That enrolled members who shall have completed twenty years of service in the Naval Reserve Force, and who shall have performed the minimum amount of active service required in their class for maintaining efficiency during each term of enrollment,

shall, upon their own application, be retired with the rank of rating held by them at the time, and shall receive in lieu of any pay, a cash gratuity equal to the total amount of their retainer pay during the last term of their enrollment.

Retainer pay shall be paid annually or at shorter intervals, as the Secretary of the Navy, in his discretion, may direct.

No existing law shall be construed to prevent any member of the Naval Reserve Force from accepting employment in any branch of the public service, except as an officer or enlisted man in *any branch of the military service of the United States or any State thereof,* nor from receiving the pay and allowances incident to such employment in addition to his retainer pay.

Enrolled members of the Naval Reserve Force shall be subject to the laws, regulations, and orders for the government of the Regular Navy only during such time as they may by law be required to serve in the Navy, in accordance with their obligations, and when on active service at their own request as herein provided, and when employed in authorized travel to and from such active service in the Navy. Members of the Naval Reserve Force shall be issued a distinctive badge or button which may be worn with civilian dress, and whoever, not being a member of the Naval Reserve Force of the United States and not entitled under the law to wear the same, willfully wears or uses the badge or button or who uses or wears the same to obtain aid or assistance thereby, shall be punished by a fine of not more than $20 or by imprisonment for not more than thirty days or by both such fine and imprisonment.

All members of the Naval Reserve Force shall, when actively employed as set forth in *this Act* be entitled to the same pay, allowances, gratuities, and other emoluments as officers and enlisted men of the naval service on active duty of corresponding rank or rating and of the same length of service. When not actively employed *in* the Navy, members of the Naval Reserve Force shall not be entitled to any pay, bounty, gratuity, or pension except as expressly provided for members of the Naval Reserve Force by the provisions of this Act.

Enrolled members of the Naval Reserve Force may, in time of war or national emergency, be required to perform active service in the Navy throughout the war or until the national emergency ceases to exist.

Members of the Naval Reserve Force shall, upon first reporting for active service for training during each period of enrollment, be credited with a uniform gratuity of $50 for officers and of $30 for men.

Upon reporting for active service in time of war or national emergency the uniform gratuity shall be $150 for officers and $60 for men, or the difference between these amounts and any amounts that may have been credited as a uniform gratuity during the current enrollment: *Provided,* That should any member of the Naval Reserve Force sever his connection with the service without compulsion on part of the Government before the expiration of his term of enrollment, the amount so credited shall be deducted from any money that may be or may become due him.

Hereafter, in shipping officers and men for service on board United States auxiliary vessels, preference shall be given to members of the Naval Reserve Force, and, after two years from the date of approval of this Act, no person shall be shipped for such service who is not a member of the Naval Reserve Force herein provided.

Members of the Naval Reserve Force may, upon application, be transferred from one class to another class for which qualified under the provisions of this Act; and may in time of war volunteer for and be assigned to duties prescribed for any class which they may be deemed competent to perform.

The Secretary of the Navy shall prescribe a suitable flag, or pennant, that may be flown as an insignia on private vessels or vessels of the merchant service commanded by officers of the Naval Reserve Force: *Provided*, That it shall not be flown in lieu of the National ensign.

The Secretary of the Navy is hereby authorized to establish schools or camps of instruction at such times and in such localities as he may deem advisable for the purpose of instructing members and applicants for membership in the Naval Reserve Force. No applicant shall be accepted for instruction unless he agrees to abide by the regulations of the school and pursue the course prescribed by the Secretary of the Navy. Persons who satisfactorily complete the course will be given certificates of qualification for the rank or rating for which duly qualified, and may be permitted to enroll in the proper class of the reserve in such rank or rating. For the purpose of carrying into effect this paragraph of the Act there is hereby appropriated, out of any money in the Treasury not otherwise appropriated, $30,000, which is hereby made available to be expended as the Secretary of the Navy may direct in the necessary equipment and maintenance of such schools and camps.

FLEET NAVAL RESERVE

All former officers of the United States naval service, including midshipmen, who have left that service under honorable conditions, and those citizens of the United States who have been, or may be entitled to be, honorably discharged from the naval service after not less than one four-year term of enlistment or after a term of enlistment during minority, *and who shall have enrolled in the Naval Reserve Force*, shall be eligible for membership in the Fleet Naval Reserve.

In addition to the enrollments in the Fleet Naval Reserve above provided, the Secretary of the Navy is authorized to transfer to the Fleet Naval Reserve at any time within his discretion any enlisted man of the naval service with twenty or more years' naval service, and any enlisted man, at the expiration of a term of enlistment who may be then entitled to an honorable discharge, after sixteen years' naval service: *Provided*, That such transfers shall only be made upon voluntary application and in the rating in which then serving, and the men so transferred shall be continued in the Fleet Naval Reserve until discharged by competent authority.

The Secretary of the Navy is authorized to assign any member of the Fleet Naval Reserve to active duty for training on board ship, upon the application of such member, but any member who has failed to perform three months' active service with the Navy in any term of enrollment shall, on the next reenrollment, receive retainer pay at the rate of $12 per annum until such time as he shall have completed three months' active service. The three months' active service with the Navy may be taken in one or more periods, at the election of the member: *Provided,* That no member shall be entitled to travel allowance unless the period of such active service is for not less than one month, or unless specifically provided for by such regulations as may be prescribed by the Secretary of the Navy.

Men enrolled in the Fleet Naval Reserve with less than eight years' naval service shall be paid at the rate of *$50* per annum; those with eight or more years and less than twelve years' naval service shall be paid at the rate of *$72* per annum; and those with twelve or more years' naval service shall be paid at the rate of $100 per annum, such pay to be considered as retainer pay for the obligation on the part of such members to serve in the Navy in time of war or national emergency: *Provided,* That for all purposes of this Act a complete enlistment during minority *and any enlistment terminated within three months prior to the expiration of the term of enlistment by special order of the Secretary of the Navy shall be considered as four years' service. The annual retainer pay of officers of the Fleet Naval Reserve shall be two months' base pay of the corresponding rank in the Navy.*

Reenrollments in the Fleet Naval Reserve shall be for four years. Officers and men enrolling in the Fleet Naval Reserve within four months of the date of the termination of their last naval service or reenrolling within four months of the date of the termination of their last term of enrollment shall receive an increase of twenty-five per centum of their retainer pay for each such enrollment: *Provided,* That men who have enrolled in the Fleet Naval Reserve within four months of the date of their discharge from the *regular* naval service shall, upon reenlistment in the *regular* naval service within four months of the date of discharge from the Fleet Naval Reserve, be entitled to the same gratuity and additional pay as if they had reenlisted in the *regular* naval service within four months of discharge therefrom.

Members of the Fleet Naval Reserve who have, when transferred to the Fleet Naval Reserve, completed naval service of sixteen or twenty or more years shall be paid a retainer at the rate of one-third and one-half, respectively, of the base pay they were receiving at the close of their last naval service plus all permanent additions thereto: *Provided,* That the pay authorized in this paragraph as a retainer shall be increased ten per centum for all men who may be credited with extraordinary heroism in the line of duty or whose average marks in conduct for twenty years or more shall not be less than ninety-five per centum of the maximum.

Any pay which may be due any member of the Fleet Naval Reserve shall be forfeited when so ordered by the Secretary of the Navy upon the

failure, under such conditions as may be prescribed by the Secretary of the Navy, of such man to report for inspection.

Members of the Fleet Naval Reserve who have established their qualifications by examination to the satisfaction of the Secretary of the Navy may be given warrants or commissions in the Fleet Naval Reserve in the grades of boatswain, gunner, carpenter, machinist, pharmacist, pay clerk, ensign for deck or engineering duties, or in the lowest grades of the staff corps: *Provided further,* That those so warranted or commissioned shall not be deprived of the retainer pay, allowances, or gratuities to which they would be otherwise entitled.

Men transferred to the Fleet Naval Reserve shall be governed by the laws and regulations for the government of the Navy and shall not be discharged from the Naval Reserve Force without their consent, except by sentence of a court-martial. They may, upon their own request, upon completing thirty years' service, including naval and fleet naval reserve service, be placed on the retired list of the Navy with the pay they were then receiving plus the allowances to which enlisted men of the same rating are entitled on retirement after thirty years' naval service. They shall be required to keep on hand such part of the uniform-clothing outfit as may be prescribed by the Secretary of the Navy.

The Secretary of the Navy is authorized in time of war or when a national emergency exists to call any enlisted man on the retired list into active service for such duty as he may be able to perform. While so employed such enlisted men shall receive the same pay and allowances they were receiving when placed on the retired list.

NAVAL RESERVE

Members of the Naval Reserve Force who have been or may be engaged in the seagoing profession, and who have enrolled for general service, shall be eligible for membership in the Naval Reserve. No person shall be first enrolled in this class who is less than eighteen or more than thirty-five years of age, nor unless he furnishes satisfactory evidence as to his ability and character; nor shall any person be appointed an officer in this class unless he shall have had not less than two years' experience as an officer on board of lake or ocean going vessels.

The minimum active service required of members to qualify for confirmation in their rank or rating in this class is three months.

The minimum active service required *for maintaining* the efficiency of a member of this class is three months during each term of enrollment. This active service may be in one period or in periods of *not less than* three weeks each year.

The annual retainer pay of members in this class after confirmation in rank or rating shall be two months' *base* pay of the corresponding rank or rating in the Navy.

NAVAL AUXILIARY RESERVE

Members of the Naval Reserve Force of the seagoing profession who shall have been or may be employed on American vessels of the merchant marine of suitable type for use as naval auxiliaries and which shall have been listed as such by the Navy Department for use in war, shall be eligible for membership in the Naval Auxiliary Reserve.

In time of war or during the existence of a national emergency, persons in this class shall be required to serve only in vessels of the merchant ship type, except in cases of emergency, to be determined by the senior officer present, when said officer may, in his discretion, detail them for duty elsewhere as the exigencies of the service may require.

The requirement as to qualifications of officers and men for confirmation in rank or rating, and as to the maintenance of efficiency in rank or rating, shall be prescribed by the Secretary of the Navy and shall be limited to the requirements for the proper organization, discipline, maneuvering, navigation, and operation of vessels of the merchant ship type while performing auxiliary service to the fleet in time of war, and length of time of employment on board such vessels in the merchant service.

Officers in the Naval Auxiliary Reserve shall exercise military command only on board the ships to which they are attached and in the naval auxiliary service.

The annual retainer pay of members in this class after confirmation in rank or rating shall be for officers, one month's base pay of the corresponding rank in the Navy, and for men, two months' *base* pay of the corresponding rating in the Navy.

NAVAL COAST DEFENSE RESERVE

Members of the Naval Reserve Force who may be capable of performing special useful service in the Navy or in connection with the Navy in defense of the coast, shall be eligible for membership in the Naval Coast Defense Reserve.

Persons may enroll in this class for service *in connection with the naval defense of the coast, such as service* with coast-defense vessels, torpedo craft, mining vessels, or patrol vessels, or as radio operators, in various ranks or ratings corresponding to those of the Navy for which they shall have qualified under regulations prescribed by the Secretary of the Navy: *Provided*, That the Secretary of the Navy may permit the enrollment in this class of owners and operators of yachts and motor power boats suitable for naval purposes in the naval defense of the coast; and is hereby authorized to enter into contract with the owners of such power boats and other craft suitable for war purposes to take over the same in time of war or national emergency upon payment of a reasonable indemnity.

The amount of active service required for confirmation in rank and rating and for maintaining efficiency in rank and rating shall be the same as that required for members of the Naval Reserve.

The annual retainer pay of members of this class shall be the same as that of members of the Naval Reserve.

VOLUNTEER NAVAL RESERVE

The Volunteer Naval Reserve shall be composed of those *members of the Naval Reserve Force* who are eligible to *membership* in any one of the other classes of the Naval Reserve Force, and who obligate themselves to serve in the Navy in any one of said classes without retainer pay and uniform gratuity in time of peace.

NAVAL RESERVE FLYING CORPS

The Naval Reserve Flying Corps shall be composed of officers and enlisted men *student flyers* who have been transferred from the Naval Flying Corps to the Naval Reserve Flying Corps *and of enlisted men who shall have been so transferred* under the same conditions as those provided by law for enlisted men of the Navy transferred to the Fleet Naval Reserve: *Provided,* That surplus graduates of the aeronautic school may be commissioned as ensigns in the Naval Reserve Flying Corps and promoted therein under such regulations as may be prescribed by the President. *Members of the Naval Reserve Force skilled in the flying of air-craft or in their design, building, or operation, shall be eligible for membership in the Naval Reserve Flying Corps. The amount of active service required for confirmation in grade, rank, or rating, and for maintaining efficiency therein, shall be the same as that required for members of the Naval Reserve. The retainer pay of members of the Naval Reserve Flying Corps shall be the same as that of members of the Naval Reserve.*

MARINE CORPS RESERVE

A United States Marine Corps Reserve, to be a constituent part of the Marine Corps and in addition to the authorized strength thereof, is hereby established under the same *provisions* in all respects (except as may be necessary to adapt the said provisions to the Marine Corps) as those providing for the *Naval Reserve Force in this Act: Provided, That the Marine Corps Reserve shall consist of five classes, corresponding, as near as may be, to the Fleet Naval Reserve, the Naval Reserve, the Naval Coast Defense Reserve, the Volunteer Naval Reserve, and the Naval Reserve Flying Corps, respectively.*

NAVAL RESERVE FORCE: For the authorized expenses of *organizing* the Naval Reserve Force, $130,000, and the unexpended balance of the appropriation for carrying into effect the provisions of the Act of March third, nineteen hundred and fifteen, relating to a Naval Reserve, be, and it is hereby, made immediately available to carry into effect the foregoing provisions relating to a Naval Reserve Force.

The retainer pay and active service pay of members of the Naval Reserve Force shall be paid from the appropriation "Pay—the Navy," and the retainer pay and active service pay of the Marine Corps Reserve shall be paid from the appropriation "Pay, Marine Corps."

Each commissioned and warrant officer on the active list of the Naval Militia shall receive compensation for his services, referred to hereinafter

as retainer pay, except during periods of service for which he may become lawfully entitled to the same pay as an officer of corresponding grade of the United States Navy or Marine Corps, at the following rates per annum, namely:

To officers of or above the naval rank or equivalent rank of lieutenant, $500;

To officers of the naval rank or equivalent rank of lieutenant (junior grade), $240;

To officers of the naval rank or equivalent rank of ensign, $200;

To warrant officers, $120:

Provided, That no commissioned or warrant officer of the Naval Militia shall be entitled to any retainer pay for any period during which he has not attended the minimum number of drills prescribed in section fifteen of an Act entitled "An Act to promote the efficiency of the Naval Militia, and for other purposes," approved February sixteenth, nineteen hundred and fourteen, or duly authorized equivalent official duty.

That each enlisted man on the active list of the Naval Militia shall receive compensation for his services, referred to hereinafter as retainer pay, except during periods of service for which he may become lawfully entitled to the same pay as an enlisted man of corresponding rate or rank of the United States Navy or Marine Corps, at a rate equal to twenty-five per centum of the base pay now, or as may be hereafter, provided by law for an enlisted man of corresponding rate or rank in the United States Navy or Marine Corps, but not to exceed $120 per annum: Provided, That such enlisted man shall receive the full retainer pay represented by said twenty-five per centum of said base pay only if he shall have attended, during any one year, the maximum number of assemblies for drill, instruction, and target practice, but for the purpose of computing pay not to exceed forty-eight (or equivalent official duty), which he shall have been duly required to attend, and a proportionate amount for attendance at a lesser number of the same, being in no case less than fifty per centum of said maximum, nor less than the minimum total number of assemblies for drill, instruction, and target practice provided for by section fifteen of an Act entitled "An Act to promote the efficiency of the Naval Militia, and for other purposes," approved February sixteenth, nineteen hundred and fourteen, or duly authorized equivalent official duty.

That no member of the Naval Militia shall be entitled to the retainer pay herein provided for until he has been found qualified, both physically and professionally, in accordance with the standards prescribed by the Secretary of the Navy, and until he has enrolled in the National Naval Volunteers hereinafter provided for.

That the compensation provided for herein shall be computed for quarterly periods under such regulations as the Secretary of the Navy may prescribe, beginning the first days of January, April, July, and October, respectively, of each year, in proportion to the number of said assemblies attended, and no compensation shall be paid to any enlisted man during the first semiannual period of any year unless he shall have attended during said period at least fifty per centum of said minimum of assemblies; but

attendance at any lesser number of said assemblies during said period shall be reckoned with the said assemblies attended during the second, third, and fourth quarterly periods in computing the compensation, if any, due him for that year: Provided, That when any enlisted man enters into an enlistment he shall be entitled to proportional compensation for that year if during the remainder of the year he shall attend a number of said assemblies whose ratio to said minimum is not less than the ratio of the part of the year so served to the whole year; and when the enlistment of any man shall expire the compensation if any, to which he may be entitled shall be determined in like manner: And provided further, That periods of any actual military duty equivalent to the assemblies hereinabove particularly referred to, except those periods of service for which, under existing or future laws, members of the Naval Militia may become entitled to the same pay as officers and enlisted men of the corresponding ranks, grades, or rates in the United States Navy and Marine Corps, may be accepted as service in lieu of such drills, when approved by the Secretary of the Navy.

Whenever a member of the Naval Militia who is employed under a department of the Government of the United States attends drills, cruises, or other ordered duty of the Naval Militia, he shall receive the amount of the salary or wages he would have earned when so employed, in addition to the amount provided for by law as a member of the said Naval Militia: Provided, however, That such attendance shall not affect his efficiency rating in said department, nor shall he suffer demotion or loss of position during or at the termination of any naval or military service when ordered upon special or active duty of any kind.

That the retainer pay provided above shall be paid quarterly, except as otherwise above provided, to officers and enlisted men of the Naval Militia through the disbursing officer provided for under section eleven of an Act to promote the efficiency of the Naval Militia, and for other purposes, approved February sixteenth, nineteen hundred and fourteen, who shall be an officer of the pay corps of the Naval Militia. The Secretary of the Navy is hereby authorized to pay to such disbursing officer so much of the amount appropriated to carry out the provisions of this Act as shall be necessary for the above purposes. When disbursing officers are traveling in the performance of their official duties under orders issued by the Secretary of the Navy they shall be reimbursed for their actual and necessary traveling expenses, the same to be made a charge against the appropriation "Arming and equipping Naval Militia."

The governor of each State and Territory, and the commanding general of the District of Columbia Militia, shall appoint either the above-described disbursing officer or such other officer of the pay corps of the Naval Militia as he may elect as accounting officer for each battalion thereof, or, at his option, for each larger unit or combination of units of the same, who shall be responsible for the proper accounting for all property belonging to the United States issued to and for the use of such battalion, or larger unit or combination of units.

Accounting officers shall render accounts as prescribed by the Secretary of the Navy and shall be required to give good and sufficient bonds to the United States in such sums as the Secretary of the Navy may direct, conditioned upon the faithful accounting for all property belonging to the United States and for the safekeeping of such part thereof as may be in the personal custody of such officer. Accounting officers may issue any or all such property to other officers or enlisted men of the Naval Militia under such rules and regulations as may be prescribed: And provided further, That the Secretary of the Navy shall cause an inspection of the accounts and records of the accounting officers to be made by an officer of the Navy at least once each year.

When accounting officers are traveling in the performance of their official duties under orders issued by the Secretary of the Navy they shall be reimbursed for their actual and necessary traveling expenses, the same to be made a charge against the appropriation "Arming and equipping Naval Militia."

That officers and enlisted men of the Naval Militia to whom property has been issued as herein provided for shall be responsible for the safekeeping and return thereof. Stoppages may be made against the compensation payable to any officer or enlisted man of the Naval Militia to cover the cost of public property lost or destroyed by and chargeable to such officer or enlisted man.

That no part of the Naval Militia which is entitled to compensation under the provisions of this Act shall be disbanded without the consent of the President.

That to provide a force for use in any emergency, including that of actual or imminent war, requiring the use of naval forces in addition to those of the Regular Navy, of which emergency the President shall be, for the purposes of this Act, the sole judge, there is hereby created a force, to be known as the "National Naval Volunteers," into which the President alone is authorized, under such regulations as he may prescribe, to at any time enroll, by commission, warrant, and enlistment, respectively, and without examination, such number of the officers and men of the various branches of the Naval Militia as he may decide to so enroll from among those of the Naval Militia who have theretofore conformed to the standard of professional and physical examination prescribed for such officers and men under section five of an Act entitled "An Act to promote the efficiency of the Naval Militia, and for other purposes," approved February sixteenth, nineteen hundred and fourteen, and who may volunteer for such enrollment; and may also similarly enroll, immediately upon the occurrence of any such emergency (subject to their first or subsequently passing examinations satisfactory to him, or may, if he shall think best, enroll without any examination), such further number of the officers and men of the Naval Militia as may so volunteer from among those of the Naval Militia who have not theretofore conformed to said standards. Such officers and men, so enrolled by commission, warrant, or enlistment, shall be eligible and liable for call for immediate service in the event of any such emergency.

That the President may also, in the event of such emergency, draft into the naval service of the United States and enroll as members of the said Volunteers as many officers and men of the Naval Militia as he may think best, and with or without examination, as he may decide, from among those of the Naval Militia who shall not theretofore have volunteered and been enrolled in said Volunteers: Provided, That no commissioned or warrant officer drafted or otherwise enrolled shall be compelled to serve in said Volunteers in a lower rank or grade than that which he held in the Naval Militia at the time of being drafted or otherwise enrolled: Provided further, That the President may commission, warrant, or rate in said Volunteers any person who shall be so enrolled as above.

That when the National Naval Volunteers are ordered by the President into the active service they will, from the date such orders are issued until such time as they may be discharged from such service, be subject to the laws for the government of the Navy in so far as those laws may properly be applied to persons not in the regular permanent naval service.

That all persons so enrolled shall be held to service in said Volunteers during the continuance of any such emergency and during the period of any existing or thereafter ensuing war, unless sooner relieved by order of the President or until reaching the age of sixty-two years for those in the naval branch and the age of sixty-four years for those in the Marine Corps branch, upon attaining which ages such persons, respectively, shall be relieved from such enrollment: Provided, That during the continuance of any such emergency or war any enrolled person who shall fail to obey the call to service of the President may be arrested and compelled to serve, and, in addition thereto, may be tried by court-martial as a deserter and punished as such in such manner as said court-martial may lawfully direct.

That any person so enrolled may tender his resignation to, or request his discharge from, the President, who may, in his discretion, accept such resignation or grant such discharge and disenroll such person, and any person so enrolled may be disenrolled by the President for any cause: Provided, That no person so enrolled shall be held against his will to such enrollment for a longer continuous period than three years, except during the pendency or duration of the emergency or of war hereinabove referred to. Any person enrolled may subsequently, upon his own application while so enrolled and if still a member of the Naval Militia, be reenrolled in any rank, grade, or rating for which he shall have been found qualified under the provisions of section five of an Act entitled "An Act to promote the efficiency of the Naval Militia, and for other purposes," approved February sixteenth, nineteen hundred and fourteen, and for which he shall also have been duly commissioned, warranted, enlisted, or rated, as the case may be, in the Naval Militia.

That every person enrolled in said Volunteers shall, from the date of the call of the President, and during the continuance of his active service under said call, stand relieved from all duty as a member of the Naval Militia, and shall, during said period, have in said Volunteers all the authority and obligations of a person of similar rank, grade, or rate in the

United States Navy or Marine Corps, shall be governed by the laws and regulations for the government of the Navy, and shall, during his time of active service, be entitled to the same pay and allowances as are, or may be hereafter, provided by law for a person of similar rank, grade, or rate in the United States Navy and Marine Corps, respectively.

That the members of the said Volunteers may be ordered to duty with the Navy or separately, and either within or without the territorial limits of the United States, and when so serving shall rank with but after those of corresponding rank, grades, or rates in the United States Navy or Marine Corps, except that for the purpose of determining who shall exercise command over a combined force, composed of vessels commanded by officers of said Volunteers, and of vessels commanded by officers of the United States Navy, acting in conjunction, and for the purpose of determining who shall exercise command on shore over a combined force composed of military units commanded by officers of said Volunteers and officers of the United States Navy or Marine Corps, acting in conjunction, all officers of said Volunteers of or above the rank of lieutenant commander (naval branch) or major (Marine Corps branch) will be regarded as junior to lieutenant commanders of the Navy and majors of the United States Marine Corps, respectively, and provided that as between themselves officers of the said Volunteers shall take rank and precedence as of the dates of the commissions in the Naval Militia under which enrolled in said Volunteers.

That when serving under the call of the President, officers of said Volunteers may serve on courts-martial for the trial of officers and men of the United States naval or Naval Militia service, or of said Volunteers, but in the cases of courts-martial convened for the trial of officers of the United States Navy or Marine Corps, the majority of the members shall be officers of the regular naval service, and officers and enlisted men of the said Volunteers may be tried by courts-martial, the members of which are members of the regular naval service, or of said Volunteers, or any or all of the same.

That when any officer or enlisted man of the said Volunteers is disabled by reason of wounds or disabilities received in the active service of the United States, when called to duty under the provisions of this Act, he shall be entitled to all the benefits of the pension laws existing at the time of his service for the benefit of members of the United States Navy or Marine Corps, respectively, and in case such officer or enlisted man dies in the active service of the United States, or in returning to his place of residence after being relieved from such active service, or at any time in consequence of wounds or disabilities received in such active service, his widow and children, or previously designated dependent relative, if any, shall be entitled to all the benefits of such pension laws.

That the President may relieve any and all persons in the National Naval Volunteers from active service when their services are no longer needed.

That no distinction shall be made between the regular naval service and the National Naval Volunteers when in active service under the call of

the President, in respect to promotions or rewards for valorous conduct, or to the conferring upon officers or enlisted men of brevet rank, medals of honor, or other rewards for distinguished conduct.

That the Naval Militia shall consist of the regularly enlisted militia between the ages of eighteen and forty-five years, organized as prescribed for the Naval Militia by law, and commissioned officers between the ages of twenty-one and sixty-two years (naval branch), and twenty-one and sixty-four years (Marine Corps branch): Provided, however, That enlisted men may continue in service after the age of forty-five years, and until the age of sixty-two years (naval branch), or sixty-four years (Marine Corps branch), provided the service is continuous.

That hereafter the period of enlistment in the Naval Militia shall be three years. An enlisted man who has served honorably for the full term of his enlistment may reenlist for a term of one, two, or three years, as he may elect. When a man reenlists within thirty days from the date of the expiration of his prior enlistment his term of service shall be considered as continuous, and shall be so dated.

That courts-martial in the Naval Militia of the several States and Territories and in the District of Columbia shall, except when the Naval Militia shall have been called into the service of the United States, consist of general courts-martial, summary courts-martial, and deck courts.

That general courts-martial shall consist of not less than three nor more than thirteen officers, and may be convened by order of the governor of a State or Territory, or the commanding general of the District of Columbia Militia.

That summary courts-martial may be ordered by the governor of a State, or Territory, or by the commanding general of the District of Columbia Militia, or by the commanding officer of a Naval Militia battalion or brigade.

That deck courts may be ordered by the commanding officer of a Naval Militia battalion or brigade, or by a Naval Militia officer in command of Naval Militia forces on shore or on any vessel loaned to a State, Territory, or the District of Columbia, or on any vessel on which said forces may be serving.

That the above courts-martial and deck courts herein provided for shall be constituted and have cognizance of the same subjects and possess like powers, except as to punishments, as similar courts provided for in the Navy of the United States, and the proceedings of courts-martial of the Naval Militia shall follow the forms and modes of procedure prescribed for such courts in the Navy of the United States.

That every precept or order for the convening of any such court may authorize said court to sit at any place or places within the territorial limits of the State, Territory, or District where such Naval Militia may be located, or organized, as the convening authority may designate, and may further provide that any such court may be convened and sit on board any such naval or other vessel, wherever the same may from time to time happen to be, or at such place or places ashore, outside the terri-

torial limits referred to above, as, in the judgment of the said convening authority, may be convenient or desirable for the purposes of such courts-martial.

That general courts-martial shall have power to impose fines not exceeding $200, to sentence to forfeiture of pay and allowances, to a reprimand, to dismissal or dishonorable discharge from the service, to reduction in rank or rating; or any two or more of such punishments may be combined in the sentences imposed by such courts.

That summary courts-martial shall have the same powers of punishment as general courts-martial, except that fines imposed by summary courts-martial shall not exceed $100.

That deck courts may impose fines not exceeding $50 for any single offense, may sentence enlisted men to reduction in rank or rating, to forfeiture of pay and allowances, to a reprimand, to discharge with other than dishonorable discharge, or to a fine in addition to any one of the other sentences specified.

That all courts-martial of the Naval Militia, including deck courts, shall have the power to sentence to confinement in lieu of fines authorized to be imposed: Provided, That such sentences shall not exceed one day for each dollar of fine authorized.

That no sentence of dismissal or dishonorable discharge from the Naval Militia shall, except when the Naval Militia shall have been called into the service of the United States, be executed without the approval of the governor of the State or Territory or the commanding general of the District of Columbia Militia.

That presidents of general courts-martial, senior members of summary courts-martial, and deck-court officers of the Naval Militia shall have the power to issue warrants to arrest accused persons and to bring them before the court for trial whenever such persons have disobeyed an order in writing from the convening authority to appear before such court, a copy of the charge or charges having been delivered to the accused with such order, and to issue subpœnas and subpœnas duces tecum, and to enforce by attachment attendance of witnesses and the production of books and papers, and to sentence for a refusal to be sworn or to answer, all as authorized for similar proceedings for courts-martial in the Navy of the United States.

That all processes and sentences of said courts-martial shall be executed by such civil or other officers as may be prescribed by the laws of the several States and Territories, except as hereinafter alternatively provided, and in any State where no provisions have been made for such action and in the Territories and the District of Columbia the same shall be executed by a United States marshal, or by his duly appointed deputy, and it shall further be the duty in any case of any United States marshal, when so required by the convening authority of any such court-martial, to execute all such processes and sentences and make return thereof to the officer issuing or imposing the same.

That the Naval Militia shall be subject to the system of discipline prescribed for the United States Navy and Marine Corps, and the command-

ing officer of a Naval Militia battalion or brigade, and the Naval Militia officer in command of Naval Militia forces on shore or on any vessel of the Navy loaned to the States, Territories, and the District of Columbia, or on any vessel on which such forces are training, shall have the power, without trial by courts-martial, to impose upon members of the Naval Militia the punishments which the commanding officer of a vessel of the Navy is authorized by law to impose.

That the amount of any fine imposed under sentence of the courts heretofore named on any member of the Naval Militia may be collected from him, or may be deducted from any amount due said member as accrued pay or retainer pay under the provisions of this Act, or otherwise.

That all fines assessed under the provisions of this Act and collected or withheld shall be paid to the commanding officer of the Naval Militia brigade, battalion, or separate unassigned unit of which the person against whom such fine shall have been assessed is a member, to be used by said commanding officer to replace lost or damaged property or for such other purposes of his Naval Militia organization as he may decide, subject to such regulations as may be prescribed by the Secretary of the Navy. Upon the receipt of a certificate from the authority convening the court as to any fine assessed by it, any United States disbursing officer concerned shall pay over any funds due the said member not exceeding the amount of such fine to said commanding officer upon the sole receipt of said commanding officer.

That courts of inquiry in the Naval Militia shall be instituted, constituted, and conducted in the same manner and shall have like powers and duties as similar courts in the Navy of the United States, except that in the Naval Militia courts of inquiry shall be ordered by the governor of the State or Territory, the commanding general of the District of Columbia Militia, or the commanding officer of a Naval Militia brigade or battalion.

That officers of the United States Navy and Marine Corps may, with the approval of the Secretary of the Navy, be elected or appointed and commissioned as officers of the Naval Militia without prejudice to their position or status in the regular service: Provided, That such officers so commissioned shall, when directed by the Secretary of the Navy, tender their resignations of such State commissions: And provided further, That nothing herein contained shall limit the authority of the Secretary of the Navy over such officers so commissioned.

That line officers of the Naval Militia may be for line duties only, for engineering duties only, or for aeronautic duties only.

That, under such regulations as the President may prescribe, the Secretary of the Navy may, upon the recommendation of the governor of any State or Territory, or the commanding general of the National Guard of the District of Columbia, authorize a limited number of selected officers or enlisted men of the Naval Militia to attend and pursue a regular course of study at any Navy or Marine Corps service school of the United States, except the United States Naval Academy; or to be attached to any Navy or Marine Corps command for routine practical instruction; and such

officer or enlisted man shall receive, out of any Naval Militia allotment of funds available for the purpose, the same travel allowances and quarters, or commutation of quarters, and the same pay, allowances, and subsistence to which an officer or enlisted man of the naval service would be entitled for attending such school, college, or practical course of instruction under orders from proper naval authority, while in actual attendance at such school, college, or practical course of instruction: Provided, That in no case shall the pay and allowances authorized by this section exceed those of a lieutenant in the Navy.

That the Secretary of the Navy shall cause to be estimated annually the amount necessary for carrying out the provisions of this Act, and no money shall be expended under said provisions, except as shall, from time to time, be appropriated for carrying them out.

That the Secretary of the Navy is hereby authorized to sell at cost and issue lubricating oil and gasoline to vessels of the Volunteer Patrol Squadrons duly enrolled in the several naval districts; and that during maneuvers or practice drills when any of the vessels of said Patrol Boat Squadrons shall be acting singly or as squadrons under the direct command or control of an officer or officers of the United States Navy, gasoline fuel shall be supplied to them free of charge.

COAST GUARD

Whenever, in time of war, the Coast Guard operates as a part of the Navy in accordance with law, the personnel of that service shall be subject to the laws prescribed for the government of the Navy: *Provided,* That in the initiation, prosecution, and completion of disciplinary action, including remission and mitigation of punishments for any offense committed by any officer or enlisted man of the Coast Guard, the jurisdiction shall hereafter depend upon and be in accordance with the laws and regulations of the department having jurisdiction of the person of such offender at the various stages of such action: *Provided further,* That any punishment imposed and executed in accordance with the provisions of this section shall not exceed that to which the offender was liable at the time of the commission of his offense.

Hereafter whenever, in accordance with law, the expenses of the Coast Guard are paid by the Navy Department, any naval appropriations from which payments are so made shall be reimbursed from available appropriations made by Congress for the expenses of the Coast Guard.

Whenever the personnel of the Coast Guard, or any part thereof, is operating with the personnel of the Navy in accordance with law, precedence between commissioned officers of corresponding grades in the two services shall be determined by the date of commissions in those grades.

Any commissioned or warrant officer, petty officer, or other enlisted man in the Coast Guard may be assigned to any duty which may be necessary for the proper conduct of the Coast Guard; and the Secretary of the Treasury in time of peace and the Secretary of the Navy in time of war may, in his discretion, man any Coast Guard station during the entire year.

or any portion thereof, maintain any house of refuge as a Coast Guard station, and change, establish, and fix the limits of Coast Guard districts and divisions.

That the Secretary of the Treasury is hereby authorized and directed to construct and equip two steam Coast Guard cutters for service on the Pacific coast and in Alaskan waters, at a total cost not to exceed the sum of $700,000; one steam Coast Guard cutter for service as an anchorage patrol boat in New York Harbor, at a cost not to exceed the sum of $125,000, such vessel to be especially constructed for ice breaking; to purchase or construct and equip two or more cutters for service in harbors and shoal waters, at a total cost not to exceed $50,000; to purchase or construct and equip three light-draft river steamboats, including lifeboats and such other life-saving appliances and equipment as may be necessary, to be used in rescuing lives and property and in distributing food and clothing to marooned people during flood times on the Mississippi and Ohio Rivers and their tributaries, for patrolling said waters for the enforcement of navigation and motorboat laws, and for rendering aid to vessels in distress, at a total cost not to exceed $240,000. On account of Coast Guard vessels herein authorized, to be available until expended, $400,000: Provided, That the Secretary of the Navy, at the request of the Secretary of the Treasury, is hereby authorized to build the vessels herein authorized, or any Coast Guard vessels hereafter authorized, at such navy yards as the Secretary of the Navy may designate.

That for the purpose of saving life and property along the coasts of the United States and at sea contiguous thereto, and to assist in the national defense, the Secretary of the Treasury is authorized to establish, equip, and maintain aviation stations, not exceeding ten in number, at such points on the Atlantic and Pacific coasts, the Gulf of Mexico, and the Great Lakes as he may deem advisable, and to detail for aviation duty in connection therewith officers and enlisted men of the United States Coast Guard. At one of these stations there may be instituted a school for the purpose of special instruction in aeronautics, and the Secretary of the Treasury is hereby authorized to employ one expert instructor in aeronautics, at a salary of $4,000 per annum, and one assistant instructor, also skilled in aeronautics, at a salary of $3,000 per annum.

At the request of the Secretary of the Treasury the Secretaries of War and Navy are authorized to receive officers and enlisted men of the Coast Guard for instruction in aviation at any aviation school maintained by the Army and Navy, and such officers and enlisted men shall be subject to the regulations governing such schools.

Hereafter officers and enlisted men of the Coast Guard, when detailed for aviation duty, shall receive the same percentages of increases in pay and allowances as are now or may hereafter be prescribed by law for officers and men of the Navy detailed for aviation duty: Provided, That no more than a yearly average of fifteen commissioned officers and a total of forty warrant officers and enlisted men of the Coast Guard detailed for duty involving actual flying in aircraft shall receive any increase in pay or allowances by reason of such detail or duty: Provided further,

That the number of third lieutenants and third lieutenants of engineers now authorized by law for the Coast Guard is hereby increased ten and five, respectively, and such portion of the Act approved August twenty-fourth, nineteen hundred and twelve, which provides that no additional appointments as cadets or cadet engineers shall be made in the Revenue-Cutter Service unless hereafter authorized by Congress is hereby revoked.

LIGHTHOUSE SERVICE

The President is hereby authorized, whenever in his judgment a sufficient national emergency exists, to transfer to the service and jurisdiction of the Navy Department, or of the War Department, such vessels, equipment, stations, and personnel of the Lighthouse Service as he may deem to the best interest of the country, and after such transfer all expenses connected therewith shall be defrayed out of the appropriations for the department to which transfer is made: Provided, That such vessels, equipment, stations, and personnel shall be returned to the Lighthouse Service when such national emergency ceases in the opinion of the President, and nothing in this Act shall be construed as transferring the Lighthouse Service or any of its functions from the Department of Commerce except in time of national emergency and to the extent herein provided: Provided further, That any of the personnel of the Lighthouse Service who may be transferred as herein provided shall, while under the jurisdiction of the Navy Department or War Department, be subject to the laws, regulations, and orders for the government of the Navy or Army, as the case may be, in so far as the same may be applicable to persons whose retention permanently in the military service of the United States is not contemplated by law.

The Secretary of the Navy, the Secretary of War, and the Secretary of Commerce shall jointly prescribe regulations governing the duties to be performed by the Lighthouse Service in time of war, and for the cooperation of that service with the Navy and War Departments in time of peace in preparation for its duties in war, and this may include arrangements for a direct line of communication between the officers or bureaus of the Navy and War Departments and the Bureau of Lighthouses to provide for immediate action on all communications from these departments.

UNITED STATES NAVAL RESERVE

Mr. Swanson, from the Committee on Naval Affairs, submitted the following

REPORT

[To accompany S. 3521.]

The Committee on Naval Affairs, to whom this bill was referred, reports the same back to the Senate with the following amendments, and recommends that the bill pass:

(These amendments are omitted as they do not apply to this article.—J. W. G.)

This bill was proposed by the Navy Department.

The necessity for an organized naval reserve force is recognized by all the great naval powers of the world.

Each of these naval powers maintains a naval reserve force organized and prepared to man the reserve ships of the regular navy and ships of the merchant marine that would be taken over for use as auxiliaries in time of war.

Prior to the war now being waged in Europe the percentages of naval reserve forces to active forces were maintained by foreign powers as follows:

	Per cent		Per cent
England	43	Italy	40
Germany	104	Austria	120
France	149	Russia	143
Japan	55		

The Office of Naval Intelligence estimates that the principal navies of the world in tonnage and personnel on July 1, 1914, were as follows:

Nation	Tonnage built and building	Personnel actives	Actives per 1000 tons	Personnel reserves	Percentage of reserves to actives	Total actives and reserves	Total actives and reserves per 1000 tons
England	2,714,106	150,609 [1]250,000	55.5 [1]93.0	65,065	43.0	215,674 [1]315,065	79.5 [1]116.1
Germany	1,306,577	79,197	60.6	82,400	104.0	161,597	123.6
France	899,915	63,846	70.9	95,236	149.0	159,082	176.7
Japan	699,916	55,736	79.6	30,550	55.0	86,286	123.3
Italy	497,815	39,913	80.2	15,892	40.0	55,805	112.1
Austria	347,508	19,531	56.2	23,431	120.0	42,962	123.6
United States	894,889	[1]66,273	74.0	[2]7,728	11.6	74,001	82.7

[1] Includes Marines. [2] Includes Naval Militia.

In the case of the United States the naval militia of the various states composed the only force that could be considered as a naval reserve force, and that amounted to only 11.6 per cent of the active forces.

The organization of the British battle fleet provided for one-half of the fighting ships in active commission with full crews, one-fourth in reserve with 60 per cent of full crews, and one-fourth in reserve with 12 per cent of full crews.

The active battle fleet of Germany consisted of 25 battleships, 8 large cruisers and 18 small cruisers. These, with all destroyers and submarines not laid up for repairs, were kept in full commission. There were in reserve 16 battleships, 4 large cruisers, and 12 small cruisers. One-fourth of the reserve battleships were kept permanently in commission.

The personnel establishment provided full crews for all ships of the active battle fleet, all destroyers and submarines not laid up for repairs, school ships, and ships on special service.

Nucleus crews, consisting of one-half of the engineer personnel and one-quarter of the remaining personnel were provided for ships belonging to the reserve battle fleet. One and one-half crews were provided for ships on foreign service, and the necessary number for shore requirements.

To these numbers 5 per cent of the total was added to make up the full quota of the active personnel of the German Navy.

It will be noted, therefore, that the two greatest naval powers maintain in time of peace a certain proportion of their fighting ships in reserve. At the same time, however, they maintain reserve forces, organized and trained, ready to respond quickly when called upon for mobilization. In this way these nations are enabled within three weeks' time or less to utilize the total effective strength of their navies without the great additional expense that would be incurred in case sufficient active forces were maintained in time of peace to fill the complement of every fighting ship.

The policy of the other great powers in this respect is quite similar to that of England and Germany.

By this policy two great economies are effected.

In the first place, there is a great reduction in the expense of maintaining a large naval armament. In the second place, many thousands of men are not withdrawn from industrial pursuits, except in time of war, when their services are actually needed, while at the same time they are organized and ready for service when required.

The United States Navy has at the present time the following vessels which are classified as serviceable:

Dreadnoughts, including the *Arizona*	12	Gunboats	26
Predreadnoughts	14	Transports	4
Old battleships	11	Tenders to torpedo vessels	8
	—	Torpedo-boats	17
Total	37	Fuel ships	20
	=	Repair ships	2
Armored cruisers	10	Supply ships	4
Cruisers, first-class	5	Surveying ships	2
Cruisers, second-class	6	Ammunition ship	1
Cruisers, third-class	15	Hospital ship	1
Destroyers	52	Monitors	7
Submarines	37	Converted yachts	5
		Tugs	48

In addition to the above there are authorized and building:

Dreadnoughts	5	Fuel ships	2
Destroyers	15	Transport	1
Submarines	38	Supply ship	1

There were on April 28, 1916, 54,031 enlisted men in the navy, representing an increase of 6684 during the last three years.

This number of men will maintain in active service and provide for the shore stations the following:

Dreadnoughts and predreadnoughts	17	Transports	2
Armored cruisers	3	Gunboats	22
Cruiser, first-class	1	Supply ships	4
Cruisers, second-class	3	Tugs	42
Cruisers, third-class	9	Tenders to torpedo vessels	6
Destroyers	31	Repair ships	2
Monitors	4	Surveying ships	2
Submarines	37	Ammunition ship	1
		Hospital ship	1

Also for the following ships in a reserve status with 40 per cent full crews:

Predreadnoughts	9	Destroyers	21
Old battleships	11	Monitors	3
Armored cruisers	7	Transports	2
Cruisers, first-class	4	Gunboats	4
Cruisers, second-class	3	Tenders to torpedo vessels	2
Cruisers, third-class	6	Tugs	6

If it were the policy of the Government to keep all serviceable ships fully manned for active service there would be required 30,000 additional men to care for the serviceable ships now built, building, and authorized. This would mean a total enlisted strength of 84,000 men required at this time, and approximately the following additional numbers for each ship that may be authorized hereafter:

Men for each battleship or battle cruiser	1000
Men for each scout cruiser	350
Men for each destroyer	100
Men for each submarine	30
Men for each repair ship	300
Men for each gunboat	130
Men for each transport	200
Men for each torpedo tender	200

Additional men would be required also for the expansion of the aviation service and proportional increases in the training establishments on shore to provide the fleet with men in the various ratings needed.

With such large increases in prospect, it is deemed, as a measure of economy, as well as a requisite for "preparedness," that the navy be provided with an adequate reserve force organized and trained under the federal government and ready to man the reserve ships in case of war.

It has been noted that apparent differences of opinion exist among naval officers as to the number of enlisted men that should be provided for the fleet. These apparent differences when analyzed are accounted for. Different officers hold different views as to the total number of active forces that should be maintained.

There is little or no appreciable difference in the estimates for the total number of men required to man all serviceable vessels of the navy. This total number, however, should be construed to include both actives and reserves.

The Chief of the Bureau of Navigation estimated that 29,000 to 30,000 more men were necessary to man all serviceable naval vessels built and building. He recommended, however, in his testimony before the Naval Committee of the House of Representatives that a large portion of these be secured in a reserve, as, from his knowledge of recruiting conditions throughout the country, he believed it would be very doubtful whether more than 10,000 to 15,000 men for the regular service could be recruited during the next year. The great majority of such men would be green or raw material, and would require a year or more of training before they would be of much value as man-of-warsmen. The great potential force for preparedness within the next year, in the opinion of the Bureau of Navigation is represented by the 25,000 ex-service men now in civil life who have already had their training in the navy, and who, if organized as a reserve force, would in case of war promptly fill the complements of the reserve naval vessels and resume the duties with which they are already familiar.

A large proportion of these men may be secured for the reserve organization if sufficient inducements in retainer pay are offered. Very few of them, however, would reenlist in the regular service because they have already established themselves in civil pursuits and have obligations to their families.

With an organized reserve force a policy could be established which would permit of the organization of a battle fleet of certain numbers of ships of various types in active commission and other less valuable units of the fleet in reserve. As new vessels would be added to the active fleet the older ones would be retired to the reserve.

At stated intervals the entire fleet, including the reserve ships, could be mobilized for drills and maneuvers and the navy thus kept in a state of "preparedness" for war. Without a reserve force there can be no such mobilization, nor could anyone foretell how long after the beginning of a war it would take to recruit the men necessary for the reserve ships and to get them ready for service.

Under the provisions of the bill as submitted, the cost to maintain 7000 men in reserve will be the same as the cost to maintain 1000 men in the regular service. As a matter of economy alone, this consideration should appeal to everyone who views with more or less alarm the constantly increasing expenses necessary for an adequate navy.

Last year the Navy Department recommended and Congress passed an act establishing a naval reserve from among the former enlisted men of the navy. The inducements in the matter of pay were not sufficient to bring into the reserve many of these men. There are now 385 of them in the reserve.

There are now about 25,000 to 30,000 men in civil life who have served 4, 8, and 12 years in the navy. They are men skilled in the duties required

on a naval vessel and would make the best material for a naval reserve that could possibly be obtained.

Many of the honorably discharged men occupy important places in their communities and have responsibilities to their families and to their employers. Many are workingmen in the various industrial trades, and live from week to week on a small wage. They are good citizens and patriotic to their flag and country, but it cannot be expected of them to give up their bread-winning pursuits without a just compensation.

The bill as submitted is broader and more comprehensive in its provisions than was the act of last year. It was recommended by the Navy Department after a year of careful study of and experience with conditions affecting the enrollment of many men who would be of use to the navy in time of war.

The bill proposes to establish a naval reserve force to consist of five classes.

Members of this force will, by enrolling in any class which may suit their qualifications and their occupations, obligate themselves to serve in time of war or during a national emergency. Upon the outbreak of war they would automatically become part of the navy and be subject to all the laws and regulations governing the same.

In time of peace they may obtain discharge from their obligations if they so request, but as long as their names remain on the roll to receive retainer pay the Navy Department can count upon them for service in time of war. Active service for training in time of peace is entirely voluntary on their part, but the amount of their retainer pay depends upon their maintaining efficiency by taking specified periods of training in the navy.

The retainer pay is increased for each four-year period of enrollment, provided that three months of active service have been performed during the preceding period.

The reservist will be further encouraged to serve for 20 years and maintain his efficiency throughout that period by being given a gratuity at the end of the time if he has lived up to all the requirements.

The Secretary of the Navy is authorized to prescribe regulations governing the qualifications of officers and men for the various ranks and ratings as obtain in the navy.

The highest rank in the reserve will be that of lieutenant commander.

A person may not be regularly commissioned in the reserve unless he passes an examination and is recommended for the rank in which commissioned by an examining board composed of naval officers of not less rank than lieutenant commander.

American citizens only are eligible for membership in four classes of the reserve. Citizens of insular possessions of the United States as well as American citizens are eligible for membership in class D of the reserve force.

All persons enrolling in the reserve force will be required to take the oath of allegiance to the United States.

The various classes of the reserve force are described as follows:

Class A will represent what may properly be called the fleet naval reserve.

It will be composed of former officers of the navy who have honorably left the service and former enlisted men who have received honorable discharges after completing one or more enlistments, who have not been out longer than 10 years.

There are now a hundred or more former officers and 25,000 to 30,000 ex-enlisted men in civil life, many of whom it is hoped will enroll in this class. Two thousand to 3000 well trained and competent men after completing enlistments return to civil life each year. It is intended to reclaim for the reserve or retain in the regular service as many of these men as possible.

This class is so closely connected with the regular service that special provisions are made in the bill for getting men of long experience. At the same time inducements are offered to the men to remain in the regular service for 16 to 20 years in order that there may be a permanency in the body of enlisted men in the navy and that the navy may retain its trained men for long periods.

To accomplish this purpose the bill provides that men who serve honorably in the navy for 16 or 20 years may transfer to the reserve in a permanent status on one-third or one-half pay, respectively, plus all longevity additions thereto.

Such men upon going into the reserve will be most valuable as petty officers, and in many cases as officers. They will be needed for training and shaking down the inexperienced and raw material.

It is considered that this particular feature in regard to 16- and 20-year men is the most important in the bill, not only for the navy itself, but for the reserve as well.

Class B will be composed of officers and men of the merchant marine who may enroll for general service. In order to fit themselves for general service they would have to take periodical training on a naval vessel and pass certain prescribed examinations.

This class might properly be called the naval reserve, as class A may be called the fleet naval reserve.

Class C: In case of war many merchant vessels would necessarily be taken over by the navy for use as auxiliaries in supplying the fleet. It would be to the best interests of efficiency if their crews were American citizens and go along with the ships. Otherwise, there would be serious delay in recruiting men to man the ships.

To meet the requirements in this respect officers and men of the merchant service employed on such vessels as are listed for service as auxiliaries in the navy in time of war will compose this class of the reserve force, which may be conveniently called the naval auxiliary reserve.

It would not be necessary to require members in this class to take active service for training on board naval vessels. They should, however, understand naval discipline and methods, and be able to communicate by navy signals, etc., and to navigate and maneuver the vessels when in company with the naval fleet.

Citizens of the insular possessions of the United States are eligible for membership in this class.

The bill provides that officers and men serving on board of United States naval auxiliary vessels be required to become members of this class within two years.

This is a very important provision, as under present laws these vessels are now manned as are merchant vessels. The Navy Department would have no control over the officers and crews in case of war. Upon the outbreak of war every ship in the naval auxiliary service might have to be laid up until officers and crews could be found for them. A delay so caused might seriously embarrass the fleet in its operations.

The provisions of the bill for this class of the reserve force are intended to assist greatly in Americanizing the merchant marine. In giving retainer pay to reservists serving on board such vessels the United States Government will assist the operators of the vessels in obtaining American seamen to man them. Such retainer pay will practically amount to a differential in wages, and will enable the American shipowners to compete with foreign shipowners who pay less wages to their seamen.

Class D: The seacoast of the United States is divided into naval defence districts. In time of war all available utilities in these districts should be brought into play for purposes of defence.

The provisions in the bill for this class of the reserve force, which might be described as the naval coast defence reserve, would make eligible for membership all persons whose occupation or experience would fit them to perform useful and effective service in the naval defence of the coast.

Persons may enroll in this class for service with coast-defence vessels, torpedo craft, aircraft, mining vessels, or patrol vessels, as they may elect, or as radio operators.

Owners and operators of yachts and power boats that are suitable for effective work as patrol vessels, mining vessels, submarine chasers, etc., are eligible for enrollment in this class.

Provision is made for schools and camps of instruction for applicants who desire to enroll. The amount of $30,000 is appropriated for equipping such schools or camps.

Under the provisions of the bill the Secretary of the Navy will be enabled to have an organization of the naval reserve force in every seaport in the United States. The organizations may include aircraft of all kinds.

The provisions for this class of the naval reserve force are intentionally made broad and comprehensive in order that the Navy Department may be able to make use of all available talent within the district that would be effective in the naval defence of the coast.

Class E: This class is intended to include those persons who in time of peace are willing to give their time for training without compensation. It may, therefore, be described as the volunteer naval reserve. Persons who are eligible for membership in any of the other classes may enroll in this class.

It is believed, however, that the majority of persons who may enroll in this volunteer class will be eligible for and perform the duties prescribed for the members in class D in the naval defence of the coast.

The provisions of this class will enable the Navy Department to utilize the services of many yacht and power boat owners, along with their boats, in time of war, and will permit of periodical training in time of peace without expense to the government.

The foregoing remarks describe the principal features of the bill recommended to the committee by the Secretary of the Navy. It was prepared after a careful study of the systems of great naval powers with a view to embracing within its provisions what are deemed to be the best features of their systems capable of application to the conditions and requirements of this country.

The Bureau of Navigation estimates that the cost of maintaining 1000 men in the reserve, including retainer pay, active-duty pay while undergoing training, subsistence while on such active duty for training, and travel allowances, will be as follows:

ESTIMATED ANNUAL COST OF 1000 MEN IN THE RESERVE FORCE

Retainer pay	$35,300
Active-duty pay while in training	23,275
Subsistence while in training	6,750
Travel to and from home to active duty	18,000
Uniform allowance	7,500
Total	$90,825

The approximate cost of 1000 men in the regular service is $630,000, or seven times the cost of the same number in reserve.

The retainer pay prescribed herein for the various ranks and ratings is moderate in amount and was tentatively recommended to the committee for consideration last January before the passage in the Senate and in the House of Representatives of certain bills federalizing the National Guard and making it a reserve for the army. These bills provided that enlisted men in the National Guard should receive pay amounting to one-fourth that of the same rating in the Regular Army, and that officers should receive certain prescribed rates of pay according to their rank.

It would seem wise that the retainer pay finally decided upon for the members of the naval reserve force should not be less *pro rata* than that which may be provided by Congress for the National Guard or the army reserve. Otherwise, the National Guard or army reserve would attract to its ranks many of the men who under similar circumstances would join the naval reserve force, and thus jeopardize or defeat the purposes of this bill, which are to create an effective reserve for the navy, our first and chief line of defence.

Should it be decided to give the naval reservists the same rate of pay that both Houses have already voted to give the National Guardsmen or army reservists—that is, one-fourth the pay of their rating—$70,600

should be added to the estimate given above to maintain 1000 men in the naval reserve force.

This would amount to an annual cost of $161,425 for every 1000 men, or slightly more than one-fourth the amount required for 1000 men in the regular service.

In other words, about 4000 men could be maintained in reserve at the same cost as 1000 regulars.

There can be no doubt that with this rate of pay an effective reserve force can be quickly raised and efficiently maintained.

In conclusion it may be stated that, in the opinion of this committee, a properly organized and trained naval reserve force is necessary in any plan for national defence; that it is an economical measure in the provisions for maintaining the regular naval establishment.

That our merchant marine is a necessary adjunct to the navy in the national defence, and should be considered in connection with the establishment of a naval reserve force.

That, inasmuch as the navy needs a reserve, and the country needs not only a navy, but also a large merchant marine, officered and manned by American citizens, it follows that the problem of the merchant marine is closely concerned with that of the navy.

That, in providing for a naval reserve force as contemplated in this bill, we would incidentally assist the merchant marine, with the result of promoting the general welfare of the country in extending its trade relations with foreign countries.

The act of last year creating a naval reserve was inadequate, the inducements were not sufficient to entice men to enroll in the reserve. It was framed, reported and passed before a thorough investigation of conditions were made. This law, as does the present amended law, depends to a very great extent for a reserve force on the 25,000 ex-service men together with the enlisted force of the active fleet. If we are to create a reserve from these men the law must, to a reasonable extent, meet the demands of these men. The conditions must be such that the men will find it advisable and to their interest to go into reserve. It makes little or no difference what the Navy Department thinks, or what the officers of the service think of the bill. The question is entirely, "what do the enlisted men and ex-service men think of it?" and the source of this information is the men themselves. With voluntary enrolment conditions must be such as to compel the men to enroll; they must be such that a man is not going to lose money and "freedom" when enrolling for reserve service. This is particularly the case in a non-military country like ours and consistent with our Constitution; patriotism will avail in event of war, but in time of peace

the sentiment for preparedness does not appeal to the active service or ex-service man as it should to the layman, for he feels that he is more or less prepared by previous training; with voluntary service the question of an enlisted force is a very serious one, and it is interesting in support of this statement to notice the difference in the percentage of reserve force and active force in countries that have compulsory service and those that have voluntary service. We find that Germany has 104 per cent and the United States has 11.6 per cent.

I have taken especial interest in this subject and decided to obtain information from the proper source and accordingly have had several called meetings of enlisted men of all ratings and classes to discuss the features of a law that would create a reserve force from the viewpoint of the enlisted men. I presided at these meetings, took no part in the discussion, my business in the premises being solely to get first-hand information. At several meetings we had representatives of 15,000 enlisted men of the active fleet and many ex-service men. By invitation of the Chief of Bureau of Navigation I submitted the results of these investigations. With this and the large amount of data at the disposition of the Bureau Chief the present bill was framed and approved by the department. I mention these circumstances to convince the service that no information upon this very important subject has been neglected by the Bureau of Navigation in framing this bill.

Several years ago there was introduced in the Senate a bill approved by the department known as the "Graded Retirement Bill." This bill provided for the retirement of men after 12, 16 and 20 years service, with the pay graded according to length of service. This bill passed the Senate and would have passed the House and become a law had it not been that at the end of the session the House was engaged in important legislation and could not take it up. The same condition that existed then for graded retirement exists to-day, and as the bill was approved by the department and had passed the Senate it would seem that there was no reason why it should not be applied now. The fact of retired men is not popular. Congress prefers that men physically fit should be employed. To meet these conditions, and as the graded retirement feature was and is very popular with the enlisted force, they suggested that this feature be introduced in the Naval Reserve Bill, but instead of retirement after lengths of active service,

men should be transferred to the reserve, with a rate of pay as prescribed in the graded retirement bill, that the reserve service should continue through life, the men retiring after 30 years service, as at present. The retired men to be excused from training but subject to duty in time of war or public emergency.

This feature is included in the present law for men of the active list with 16 or more years service. It would be found that the necessity for re-enrolment ceases after 20 years service and up to 20 years service men with 16 years service would enroll after their term of enlistment which they are serving expires.

We can only surmise what results the law just enacted will give; we must give it time to work, time to digest and be understood by the enlisted men and the civilians. The law seems to be popular with men of the service, and no doubt the hopes of the framers of the law will be realized. If we do not get all the reserve we need and must have, we shall have another good reason for compulsory training and service.

The present Congress has appropriated for 68,000 men; the Bureau of Navigation estimates that we need 84,000 to keep the serviceable ships fully manned, but with the vessels allowed by this Congress we shall need 13,000 additional men, expanding the bureau's estimate to 97,000. It is reasonable to suppose that the next Congress will provide additional men to fill the complement of the new ships as authorized, so that we can work on being 23,000 men short of the active complement of the entire fleet. The President has authority whenever in his judgment a sufficient national emergency exists to increase the enlisted strength of the navy to 87,000 men. It seems to me that it would not be difficult to convince the President that the emergency does exist and that we now need the 87,000 men in order to properly prepare the fleet for battle.

This shortage then indicates the number of ships and their reduced complements we must place in reserve in order to maintain a full complement for vessels desired to be kept in the active fleet.

We can now consider what the complement of a vessel in reserve should be or the minimum number of active men we must allow a capital ship in reserve. After this vessels must be placed in ordinary.

First: A reserve has no place unless it can mobilize at any time on radio orders.

Second: Mobilization is to aid or assist the active fleet, hence it is not complete or of any practical use unless all the units have their fighting efficiency intact.

Third: The climax of our business is to hit the target and to hit the greatest number of times in the shortest possible time and at the instant we are required or ordered to do so. These considerations require that under no circumstances can we reduce the active complement of the gun or turret divisions of vessels in reserve.

A vessel can always be mobile with 50 per cent of her engine force aboard and can maintain this mobility until the remaining 50 per cent of the complement is broken in. We can maintain battle efficiency in reserve with the electrical and radio divisions at 50 per cent of their complement, as there will no doubt be many men in reserve whose trade or business will fit them for that duty; with the secondary batteries 50 per cent of their complement will allow one of the batteries to be used. The remaining divisions aboard a vessel in reserve may be reduced to a minimum that will allow the rest of the vessel and matériel to be kept in perfect fighting condition. The remaining men of a full complement for vessels in reserve must be supplied from the naval reserves upon mobilization, and they must be *organized* and *trained* to meet the requirements of mobilization.

It is a fact that a vessel of war begins to lose its fighting efficiency the moment we begin to change the personnel or numbers of the crews of the guns or engine force, and one of the chief reasons why we do not advance beyond a certain stage in gunnery is because the guns crews are changed so frequently. We spend a year in reaching the climax of efficiency at record practice; that being over, guns crews are reduced or changes are made, team work is ruined and habit is lost.

The Bureau of Navigation has given this matter most serious attention with a view to keeping the same personnel aboard ships as long as possible; this is most difficult if not impossible with voluntary service. With compulsory service there would be no difficulty.

Operations guided by the political aspects of the world will decide how many ships are to be kept in active service, how many in reserve, how many in ordinary. The mission to be carried out

by the navy is in its hands and upon its decision will depend how many men are required for active service, how many for reserve service, but the consideration of this matter of personnel we can positively say *must* be governed by the fact, the axiom, that no vessel in active service or reserve shall ever lose its fighting efficiency. Mobilization must be possible at any moment, and such mobilization for battle alone. If we have not the men to man the vessels necessary to fulfill our mission, we must get them or the navy is inadequate. How vividly in this is the importance of the man behind the gun and in the engine and fire room brought before us. What is cost if it brings to us a well-balanced, adequate personnel? We pay a large amount for adequate, well-balanced matérial without complaint, why not be ready to pay sufficient for an adequate well-balanced personnel? To make the material go and to hit the target?

It is remarkable in localities where the navy is so much in evidence, where the association with the navy is so intimate, where the activities of men of war and naval establishments give so much material advantage to the inhabitants, there are so few enrolments for reserve service.

There seems to be an apathy caused maybe by having the mind free from thoughts of war during long years of peace, or possibly from a lack of knowledge of the requirements of the law creating a naval reserve. The men of these localities would refute any charge of lack of patriotism, but the fact remains that they do not seem to appreciate their obligations to the country with the protection and national existence the navy guarantees to them. We need moral preparedness, in having men realize the basic principle of democratic government where manhood suffrage demands as a matter of course manhood service. With such moral preparedness the up-keep of material would be a simple matter.

This may be accomplished by a campaign of education, put in operation over the country where enrolments for reserve service might naturally be expected and refers particularly to the men of the fifth class of reserves. After investigation, when the provisions of the law are known and understood, I am confident that men will respond.

The department must proceed to the efficient administration of the law creating an adequate naval reserve and place the enrolment for reserve service with the recruiting parties for active ser-

vice; under such circumstances we may get desired results on the coast and great lake towns and cities by educating the men to the needs of a personnel reserve for the navy.

We have created the sentiment for a personnel reserve for the naval service, we have gotten results from this sentiment in the law creating the reserve. Administration of the law now begins, and it is up to the men of this non-military country between the ages of 18 and 45 years who are physically qualified, to give further results and decide whether or not we must resort to compulsory training and compulsory service.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

OUR NAVY AND THE WEST INDIAN PIRATES

(CONTINUED)

A DOCUMENTARY HISTORY

By REAR ADMIRAL CASPAR F. GOODRICH, U. S. Navy

Comparatively few instances of piracy are reported in the newspapers of 1818. In May, the schooner *Catharine and Jane,* of Philadelphia, was boarded off St. Jago de Cuba, and robbed of six or seven thousand dollars in money. The crew were barbarously treated. Also, the schooner *George Armistead,* Gatechair, of Baltimore, was boarded and robbed by a piratical schooner and suffered to proceed.[1]

On a date not known, the schooner *Commerce* was plundered, near the "Berry Islands." Captain Patterson, U. S. N., speaks of these, quite correctly, as the "Bahamas," of which they are a part.[2]

On July 7, the schooner *Eliza,* Brown, was taken by the pirates off the harbor of La Vache. One man was killed and the remainder of the crew threatened. The vessel was robbed and carried into La Vache.[1]

To these must be added the ship *Emma Sophia,* from Hamburg to Havana, which was boarded on December 19, by a piratical schooner of 30 tons, 1 gun, 30 men, between Bahama Bank and Salt Key Bank. The ship was sent to a small port "formed by the Florida Isles and the Martyr's Reef," and was plundered to the tune of $5000. The captain of the pirate vessel was a Spaniard and "the worst man on board an American ship." The crew of the *Emma Sophia* were brutally treated and most seriously injured.[2]

[1] MWHP.
[2] MHM, February, 1911.

It was Mexican privateers that furnished our navy with its chief opportunities for good work, as shown by the following letters:

NEW ORLEANS, August 10th, 1818.

Sir: I have the honor to report to you that Lieut. Comt. Cunningham, Comg. U. S. schooner *Fire Brand* detained and has sent in for adjudication the armed Schooner *La Maison* sailing under the Mexican flag mounting five carriage Guns, a complete equipment of small arms & Forty men, commanded by a man named La Maison, belonging to this City, who has been for some years depredating upon the Commerce in the Gulf of Mexico, & several times indicted by the Grand Jury in this City. This Vessel was Captured the latter part of last year from the Spaniards by the Schooner *Eugene* under Mexican Colours commanded and owned by this La Maison, sent to Galveston where she remained 'til a few months ago, when La Maison left this place, proceeded to Galveston and fitted her out as a Cruiser under the Mexican flag with a Commission bearing date July 16th, 1815, purporting to have been granted by the Supreme Mexican Congress. The small arms, provisions, Stores & munitions of War were taken from this place.

On the 28th Ultimo the U. S. Ketch *Surprise* Lieut. Comt. McKeever Captured close in with the land of chem ore[3] (sic) Caminada, a small Schooner of about 10 Tons under the Mexican Flag from Galveston, armed with one 3p^{dr} pivot mounted, having on Board when captured 8 men,—one of the Lafittes (to whom she belongs) with Six men and some merchandise had been landed from her at Caminada the preceding Evening. The *Fire Brand* & *Surprise* will proceed again to sea immediately, the *Enterprise*[4] is now out.

I have the honor to be
With great respect
Your Obt. Sevt.
DANL. T. PATTERSON.

The Hon.
Benjamin W. Crowninshield
Secretary of the Navy
Washington.[5]

Patterson's force made up in activity for its lack of magnitude:

NEW ORLEANS, November 18th 1818.

Sir: I have the honor to report to you the capture by the U. S. Ketch *Surprise* Lt. Comt. McKeever of a Small Schooner in Ballast under Mexican Colours coming from Galveston & Bound to this place, having on board the ex French General Humbert, who had for many months been exercising the Office of Governor of that place & its dependencies, and as such issuing commissions to Eleven Privateers, a list of which I herein enclose;—the

[3] Cheniere Caminada?

[4] Brig commanded by Lieut. Lawrence Kearney.

[5] C. L., 1818, Vol. 3, No. 90.

above mentioned Vessel was also Sailing under his Commission. On Board of her were a number of French emigrants from the French settlement of Camp D'Asile,[6] which has been abandoned & the inhabitants dispersed in consequence of the orders of our Government as Communicated to them by Mr. Graham. From everything I can learn, a total abandonment of Galveston by the Piratical Association will immediately take place if it has not already, in consequence of the frequent capture of their cruisers by U. S. Vessels, the great difficulty & loss they experience in introducing their Captured goods into the United States & the seductive invitation of Aury at old Providence, whither they will repair & under his Commissions infest the West Indees. The *Fire Brand* is on our Western Coast & will I hope bring in for trial some of the vessels stated in the within list. The Schooner Captured by her & reported by my letter of 10th Augt. ultimo is the last mentioned one on that list.

I have the honor to be
With Great Respect
Your Obedient Sevt.
DANL. T. PATTERSON.

The Honble the Secretary of the Navy
Washington.[7]

(Enclosure to Captain Patterson's letter of November 18.)

Notes des Commissions Mexicaines en Course concéderpar le General Amble Humbert aux Capitaines des Corsairs ci dessus . . . .

		Guns
Capitaine	W. W. Mitchel	1
Ditto	Eue Moutteon	1
Ditto	Tn Michel	1
Ditto	(Thoms Williams) Ketch *Surprise*	1
Ditto	D. Andres	2
Ditto	Franco Thomasy	2
Ditto	Frank	2
Ditto	Andre (Italien)	2
Ditto	Ajustin (Plusieurs)	3
Ditto	Gambi	2
Ditto	Maison	2
	(Captured by the *Fire Brand*)	

Toutes les Commissions données aux dites Capitaines, en arrivant dans ce port de Galveston donnerons un quincieme de la valeur de leur prizes qui feront au Genl. Amable Humbert, pour les avoir concéder les Commissions Mexicaines.

[6] Doubtless the French colony of Galveston.
[7] C. L., 1818, Vol. 4, No. 105.

NEW ORLEANS December 2d 1818.

Sir: Enclosed I do myself the honor to lay before you Lt. Comdt. Cunninghams report of his last cruise which will inform you of the state of things at Galveston, and the continued course of Piracy & Smuggling which is pursued by the Lafittes; the *Fire Brand* will again proceed to the West[d] so soon as she has received a supply of provision.

The necessity of an additional force of two small vessels is evident from this report—had I the *Lynx* & the prize Schooner *La Maison*, which is admirably adapted for this Station & will be sold very shortly, I could very soon break up the Galveston association, suppress smuggling & protect the Revenue. The Brigs draw too much water for the western coast in consequence of the numerous shoals, and they cannot make a harbour west of the Balize should their safety render it necessary.

The goods captured in the Boats as reported by Lt. Comd[t] Cunningham are deposited in the Custom House & libelled under the Revenue laws.

I have the honor to be
With great Respect
Your Obed[t] Servt.
DANIEL T. PATTERSON.

The Hon[ble]
The Secretary of the Navy
Washington.[8]

The following is Lieutenant Cunningham's report, mentioned in Patterson's letter:

U. S. SCHOONER "FIRE BRAND"
S. WEST PASS 22[d] Nov. 1818.

Sir: I have the honor to inform you of this vessel's arrival at this place from the westward; agreeable to your instructions of the 25[th] Sept. I proceeded off Galveston, examining all the Bays & Bayous on my way down, but from the almost constant blows, I was not able to lay off that place a sufficient length of time to ascertain minutely the vessels that were in Galveston, but from certain information and that too which may be relied on, the *Hector* (or any other vessel answering to her description) has never been there. The Felucca which you mentioned in your order of the 5th Oct. had not left Galveston on the 10th inst. but was reported to sail in company with a large prize Schooner, both full of select dry goods and said to be very valuable; all the property of Lafitte who premeditates sailing in them with the intention of smuggling them in. Their lading consists in part of the Cargoes of three different prizes carried in by the Privateer *Black Snake* or *Colibra* owned by Lafitte about the middle of last month. This vessel has again sailed on another Cruise, but there are several prize vessels still remaining and Lafitte is the sole person in power; he is *civil* and *Military Governor* and *Chief Judge*, and in fact makes laws, and governs at his own discretion, without any person to oppose his power. He resides on board an old prize brig.

[8] C. L., 1818, Vol. 4, No. 118.

On the 3d Inst. I fell in with, off the River Sabine, two boats with a small quantity of dry goods and Spanish wine in demijohns, these Boats being destitute of papers and the whole intended for an illicit trade I detained them; and on the 10th and 15th Inst. Captured two other boats under similar circumstances, but in consequence of their having several sick on board, and some females, and the *Fire Brand* having but a small quantity of water on board, finding it impossible to procure any on the Coast, wishing to extend the cruise of the vessel as long as possible; and having no place to accomodate females I thought it most prudent, and advisable to suffer two of the boats to proceed with the prisoners to the Calcasieu settlements; those boats had been kept in a regular and illicit trade between Galveston and Calcasieu, and there is an immense traffic and smuggling carried on between the two places, tending to defraud the U. states of its just revenues, and by persons concerned in a more or less degree with Lafitte. . . . .

Sir,

I have the Honor to be respectfully

Your Obt. Servt.

Signed THOS. S. CUNNINGHAM.

Commodore Danl. T. Patterson,
Comg. U. S. Naval Forces
New Orleans.[9]

Affairs at this time in the Gulf of Mexico were in a decidedly chaotic condition, due to the revolt of the Spanish colonies and to Spain's efforts to maintain her supremacy. Especially was Florida or, as then spoken of, *the* Floridas, east and west, a thorn in our side concerning which President Monroe spoke in measured but forcible terms, as follows:

A state of things has existed in the Floridas, the tendency of which has been obvious to all who have paid the slightest attention to the progress of affairs in that quarter. Throughout the whole of those provinces to which the Spanish title extends, the government of Spain has scarcely been felt. Its authority has been confined almost exclusively to the walls of Pensacola and St. Augustine, within which only small garrisons have been maintained. Adventurers from every country, fugitives from justice, and absconding slaves have found an asylum there. Several tribes of Indians, strong in the number of their warriors, remarkable for their ferocity, and whose settlements extend to our limits, inhabit those provinces. These different hordes of people, connected together, disregarding, on the one side, the authority of Spain, and protected on the other, by an imaginary line which separates Florida from the United States, have violated our laws prohibiting the introduction of slaves, have practised various frauds on our revenue, and committed every kind of outrage on our peaceable citizens, which their proximity to us enabled them to perpetrate. The invasion of Amelia Island

[9] C. L., 1818, Vol. 4, Encl. to No. 118.

last year by a small band of adventurers,[10] not exceeding one hundred and fifty in number, who wrested it from the inconsiderable Spanish force stationed there, and held it several months, during which, a single feeble effort only was made to recover it, which failed, clearly proves how completely extinct the Spanish authority had become, as the conduct of those adventurers, while in possession of the island, as distinctly shows the pernicious purposes for which their combination had been formed.

This country had, in fact, become the treatre of every species of lawless adventure. With little population of its own, the Spanish authority almost extinct, and the colonial governments in a state of revolution, having no pretentions to it, and sufficiently employed in their own concerns, it was, in a great measure, derelict, and the object of cupidity to every adventurer. A system of bucaneering was rapidly organizing over it, which menaced, in its consequences, the lawful commerce of every nation, and particularly of the United States: while it presented a temptation to every people, on whose seduction its success principally depended.[11]

The purchase of Florida in the succeeding year gave our government a control over this section which enabled it to put an end to an intolerable nuisance.

1819-1820

The depredations on our commerce in West Indian waters, under the flimsy pretext of the exercise of belligerent rights by Spain's possessions on this continent, now in general revolt, had become so extensive in number and frequently so barbarous in their execution, that Congress was compelled, not only to take cognizance of them, but also to provide for putting a stop to them by force. This it did in an act approved March 3, 1819.[12]

One might suppose that so threatening a declaration would have caused at least a notable diminution of these nefarious practices, but if it had any effect at all the records about to be quoted bear no such evidence. Rather do they show redoubled efforts on the part of the offenders and a corresponding increase in our naval activity. Were piracy to be graphically represented as a curve, we should find ourselves approaching the sharp upward trend leading to a maximum. The events of the year 1819 speak for themselves.

The alarming extent to which depredations on the commerce of the world were at that time carried by adventurers of all nations, using the flags of the new states of South America, in vessels fitted out ostensibly to cruise

[10] Commodore Aury, *vide supra.*
[11] Monroe's Annual Message, Nov. 17, 1818.
[12] See Appendix.

against the ships of Spain, but extending their predatory visitations to the ships of other countries, and passing, with great facility and in very many cases, from the character of privateers to that of pirates, must still be well remembered by many. The Republics of Buenos Ayres and Venezuela had given most encouragement to these predatory enterprises; they had issued commissions for privateers, without limit or qualification, to adventurers who thronged from all parts of the world to their ports, which they enriched by an influx of spoil. The question, too, of blockade, which has been an instrument of plunder in the hands of the most powerful nations, was turned by these rising nations to the same unprincipled uses. Our commerce extended over the world, and, especially in the South American seas, had suffered most severely. The government had determined to put an end to a system which could no longer be endured. But, in effecting this desirable object, it was desirous of not wounding or giving offence to nations whose outset in their career the United States had been the first to hail and recognise, and whose friendship they were desirous of cultivating. To put down a practice which, in interest and honour, we could no longer tolerate, without creating enemies, was a task of no trifling delicacy, requiring in the agent judgment, energy, and discretion. It was this duty that Mr. Thompson[13] was now desirous of intrusting to Captain (O. H.) Perry. Such force as he might deem necessary was to be placed at his disposal, and he was to go out in a diplomatic as well as in a military character, receiving extra compensation for his diplomatic services from the department of state, under whose orders he was to be placed for that portion of his duties.

. . . . He learned that it would be necessary to visit Angostura, more than three hundred miles up the Orinoco; and, as the *John Adams* would be unable to pass the bar at the mouth of the river, over which there is only sixteen feet water, he wrote to the secretary, then at New-York, to suggest the expediency of accompanying the *John Adams* by a vessel of lighter draught. By return of mail, the schooner *Nonsuch* was placed at his disposal for this service. . . . .

Proceeding on their course, the two vessels arrived, on the fifteenth of July, at the entrance of the Orinoco, when the commodore shifted his flag to the *Nonsuch*, and ordered the *John Adams* to Port Spain, distant about a hundred and fifty miles, to await his return. Having received a pilot outside the bar, the *Nonsuch* crossed and commenced the tedious ascent of the river, having more than three hundred miles to run against the current. . . . .[14]

In Perry's diary are recorded the events of this expedition up to the time he fell ill. Of his interview, on July 28, with the Vice President of Venezuela, he says:

I then furnished Mr. Zea with the two acts of our Congress with regard to neutrality and piracy, and demanded indemnity for various spoliations,

[13] Secretary of the Navy.
[14] COP, II, 188, 190, 197.

particularly the unjust seizure of American property by the schooner *Brutus*, commanded by Nicholas Joly, under the Amelia Island flag, which property had been condemned illegally, and sold within the territory of Venezuela. I also explained the view of the government with regard to privateers, and that commissions issued to them in blank were considered illegal. I asked also for an official list of those commissioned by Venezuela, that I might forward it to our government.[15]

After what seemed an interminable delay,

On Wednesday, the eleventh of August, Perry at length received from the Venezuelian secretary of state a reply to a note addressed by him to the Vice-president, claiming indemnity for the vessels and property belonging to the citizens of the United States, illegally captured by the privateers and cruisers of the republic, and condemned within its territory. In this reply the principle of restitution was admitted, and promise was made of an early fulfilment of its obligation by the republic. The vice-president had previously pledged himself, on the behalf of the republic, that its cruisers and privateers would henceforth be restricted within narrower limits, and, by holding itself responsible for illegal captures, had contracted a motive of interest as well as duty to restrict them closely to the admitted rights of belligerants.[16]

Detained by certain unavoidable formalities, it was not until the 15th of August that he weighed anchor and dropped down the river. He had succeeded in his mission, but at the cost of his life. He died of yellow fever at sea on August 23, on board of the *Nonsuch*.[17]

On July 9, the brig *Pedler*, of New York, was taken in lat. 34° 20′, lon. 54°, and robbed of many articles, after which the vessel was suffered to proceed. Another prize of the pirates was the schooner *Blazing Star*, Captain Snow, of Baltimore, which was taken near the Moro, and plundered. We hear of still another—the schooner *Adeline*, Captain Ellis, which was boarded off the Florida Keys by a piratical boat, which robbed her of all she had on board and then left her.[18]

Captain Patterson writes from New Orleans on July 17, 1819, as follows:

Sir: It is with feelings of mortification I do myself the honor to report to you that by the mail of yesterday morning from the Balize information was received here of most daring acts of Piracy having been committed

[15] COP, II, 203.
[16] COP, II, 216.
[17] Other reference—JRS, III, Chap. XV.
[18] MWHP.

on the 10th inst. in this River and only a few miles above the Block House, on several merchant Vessels by a party of armed men, nine in number, and in an open Boat. What renders this Robbery most extraordinary is that it was committed in open day and on several different Vessels, all in sight of and not far distant from each other, and that no opposition was attempted, though the Crews and Passengers of those Vessels must very greatly have exceeded the Pirates in number and force.

This intelligence was received by me at 10 o'clock in this morning, and at 3 P. M. a Force in fleet rowing Boats of 28 officers and men were dispatched in pursuit of the Pirates by way of the River, and thro' the Lakes and Bayous towards Barataria, & orders sent off for the *Bull Dog*[19] to proceed via the Chandeleur & Britton Isles to the Balize. One of these routes they must take. Presuming it will meet your approval, I have ventured to authorize the officers sent in pursuit to offer a reward if found necessary for a discovery of their retreat; that may lead to their apprehension, not exceeding three Hundred dollars.

This piratical boat was unquestionably manned and armed from this place, nor is it practicable effectually to prevent such acts except a Vessel of War is stationed constantly in the River at the Point where the River branches off into its several openings to the sea; and so to station a Vessel during the Summer and Fall months of the year would be to condemn officers and men to almost certain Death. This is asserted from actual experience and not from mere supposition, viz., the Ship *Louisiana* in 1813 and Brig *Aetna* 1814. . . . .

I have the honor to be,
With Great Respect,
Your Obdt. Servt.,
DANL. T. PATTERSON.

Honbl. Smith Thompson,
Secretary of the Navy,
Washington.[20]

It would seem as if Patterson's boat expedition was very sluggish in getting started. Naturally, the bird had flown before the hunters arrived.

What is surprising in the foregoing episode is the same supineness of officers and men on board merchant ships in the face of piratical attacks, which we have had occasion to notice before. A bold front and a few volleys of musketry would frequently have driven off the ruffians, especially in this case where naval assistance was neither remote nor reluctant.

The Revenue Service worked conjointly with the navy in suppressing piracy, or independently, as circumstances dictated.

[19] A felucca, 2 guns.
[20] C. L., 1819, Vol. 3, No. 73.

Thus, on August 31, 1819, the revenue cutter *Alabama* captured a piratical schooner below New Orleans.[21]

Again, later in the year, she distinguishes herself:

> The United States Revenue Cutter *Alabama,* Captain Loomis, on her way to her station off the Mississippi, captured a piratical schooner of 2 guns and 25 men fitted out at New Orleans and commanded by a fellow named Le Fage. . . . . He had commission in blank signed by Humbert, Governor of Texas.[22]

A week later, the same paper prints the statement that this vessel belonged to Jean Lafitte and was commissioned at Galveston.

> General Long, Commander of the adventurers in Texas, is said to have approved of her equipment.[23]

Also, during August of this year, the revenue cutter *Louisiana* captured the privateer *Le Brave,* but at just what point is not stated.

Barataria was much on the minds of the New Orleans community, and very naturally, since they saw the work of its gang at close hand. They were outraged in spirit and harmed in pocket through the illicit trade which affected seriously all forms of legitimate business. The impatience of the citizens of that city with the slackness of the federal government can well be understood. It is thus expressed in an extract of a letter dated New Orleans, August 4, 1819:

> We have received a report in this city from Baratarians that the renegade Mitchell has collected together upwards of 150 desperadoes and that he has declared they will all perish within their intrenchments before they will surrender to my force. . . . . I hope they will wake from their slumbers in Washington and try to put a stop to such plunders at our very doors, etc.[24]

It will be observed in reading of piratical activities that a number of privateers were operating at this time under what would now be called Argentine colors. It is mentioned here merely to draw attention to the fact that the Gulf of Mexico and the Caribbean Sea were favorite waters for such operations, even by vessels purporting to hail from very remote parts.

[21] MWHP.
[22] N, Oct. 16, 1819.
[23] N, Oct. 23, 1819.
[24] N, Sept. 11, 1819.

The disposition of his forces is reported by Commodore Patterson, under date of September 29, 1819, as follows:

Hornet[25] cruising between the Balize and the coast of Florida; *Lynx*[26] between Balize and Sabine Pass, and as far as Galveston; Ketch *Surprise* in the Mississippi River; *Bull Dog* and four gunboats at Barataria (42 officers and men); one launch with 12-pounder carronade and 13 men to be stationed in Lake Borgne.[27]

The expedition, under Master Commandant Louis Alexis, returned after exploring the numerous bayous between the Mississippi and Barataria, and "destroying the piratical establishments." Three prisoners were taken, one of whom was the man who steered the boat that plundered vessels in the river. There was also captured, "concealed in an unfrequented bayou," a small cutter sloop mounting one long 6-pounder.[28]

Lafitte comes to the front again about this time and in a position which bears the marks of official sanction. On October 7, 1819, Governor James Long, of the Republic of Texas, appointed him Governor and Commander-in-Chief of the Island of St. Louis and Port of Galveston, with "power to grant letters of marque and reprisal against the King and subjects of Spain, to all vessels within his government."[29]

The United States schooner *Lynx* kept up the good work by taking, in the Gulf of Mexico, two schooners and two boats, on October 24, and a boat in Galveston Bay on November 5. The prizes belonged to Lafitte's squadron.[30]

Such small successes were without material influence on the situation wherein piracy was indistinguishable from privateering. The feeble efforts of our government were wholly inadequate to cope with this vexatious and humiliating state of affairs. No wonder that public sentiment began to be aroused and to find expression in print, of which the following is an example:

The West India seas are still infested by pirates of the most abandoned character. They are of all nations, and respect no flag. Their chief cruizing ground appears to be off the southern coast of Hayti, and generally in

[25] Brig, 18 guns, Master Commandant George C. Read.
[26] Schooner, 6 guns, Lieut. J. R. Madison.
[27] C. L., 1819, Vol. IV, No. 45.
[28] C. L., 1819, Vol. IV, No. 45.
[29] C. L., 1819, Vol. V, No. 38 (encl.).
[30] E., 76.

open boats, which shews that their rendezvous must be on some unfrequented parts of that Island. But there is no reason to believe that they are in any manner sanctioned by the local authorities.

We are disgusted too with the frequent account of villainous acts committed under the independent flags. It is time that some *understanding* existed with the patriot governments in this respect. We are sure that they do not sanction such abuses. Some means should be adopted to ascertain what vessels are really authorized by them, which presumes that there is some security for their good behavior. At present, any set of depredators seem to use what flag they please, making commissions for themselves or accepting them from any one. If some remedy is not fallen upon to repress this growing evil, the United States and Great Britain and other maritime and commercial powers, will be *compelled* to defend themselves, by cruising for and severely handling these violators of the law.[31]

It would seem from the following note that Lafitte did not enjoy a monopoly of seizures:

December 9—The brig *Planter*, Hart, was taken off Cape St. Antonio, and plundered by a pirate. Vessel given up.[32]

Nevertheless, it was the work of the Galveston band which excited the most ire, as can be seen from this extract:

The most rascally piracies are still committed off the mouths of the Mississippi, always accompanied with savage abuse and often with murder. We trust that no longer delay will be made to put an end to these things. There should be a floating force on the station sufficient to ferret out the villains and bring them to punishment with a strong arm.[33]

On December 18, the ship *Corsair*, Captain Robinson, was reported captured at 11 o'clock by an insurgent vessel, the name and class of which is not known.[34] And so the year 1819 closes with piracy rampant and the American people just awakening to the necessity of prompt and efficient action on a scale commensurate with the demands of the hour.

During the years 1819 and 1820, piracy took on larger proportions. Tardily aroused, public sentiment in the United States now began to find definite expression in appeals to the government for vigorous action. It was high time to prod the authorities in Washington for, without suitable vessels in adequate numbers, our poor little navy was quite powerless to stem the rising tide

[31] N, Nov. 27, 1819.
[32] MWHP.
[33] N, Dec. 25, 1819.
[34] NAV, No. 38-6.

of disorder and rapine. That it did its best with the slender resources at its command may be confidently asserted, but the depredations on our commerce had grown to such portentous dimensions that nothing less than a national campaign—of education at home and widespread activity abroad—could possibly suffice. The views of the business world are thus modestly presented to the administration in Washington:

BOSTON, December 1, 1819.

To James Monroe, President of the United States of America, etc.

The undersigned ask leave to lay before you the annexed statement of facts, relating to piracies and unlawful acts of armed vessels, committed, in many instances near our coast, or in the W. India seas, and some of them, they regret to add, by vessels out of our own ports.

Your memorialists are aware that this subject has already engaged the attention of government, and it is with this view of co-operating with them in checking the progress of this alarming evil, that they have collected this list of piracies, supposing that, from their connection with commerce, more facts of this nature came to their knowledge than to that of the members of government.

Whether the late unparalleled increase of piracies is to be ascribed to defects in the laws of civilized nations, or the laws not being enforced, or to other causes, it is alike certain that it is an alarming and growing evil, which a just regard to the interest of commerce, no less than to the moral state of society, requires to be forthwith repressed.

Reposing, as they do, with full confidence in the wisdom of the administration, they abstain from offering any comments or opinions, not doubting that, after having their attention called to the facts, the government will pursue such measures as the nature of the case requires.

ARNOLD WELLES,
President of the Mass. fire and Marine Ins. com.
THOMAS PERKINS,
President of the Union Insurance Company.
JNO. T. APTHORP,
President of the Suffolk Insurance Company.
JAMES HALL,
President of the N. E. M. Ins. Company.
NATH. GODDARD,
President of the Merchants' Ins. Company.
FRANCIS J. OLIVER,
President of the American Ins. Company.

Here follows the names of *forty four* vessels robbed, or relations of piratical circumstances, collected from one newspaper during the year 1819![*]

[*] This list is given in the National Intelligencer, Washington, Jan. 1, 1820.

We should, indeed, be glad to see some vigorous measures adopted to check the progress of this growing evil. What we long ago predicted has come to pass, to an alarming extent—our country is drained of its seamen by vessels sailing under real or pretended commissions from Buenos Ayres, Artigas, Brion, and several others states or *individuals*, and the worst of all is, the demoralizing influence which these things have had upon the theretofore good character of our sailors.

It is probable that, between privateering and piracy, and all the hazards and hardships belonging to them, we have absolutely lost not less than 15 to 20,000 seamen since the conclusion of the war with Great Britain.[36]

Some 16 pirates captured by Captain Loomis of the revenue cutter *Alabama* were tried in New Orleans in November, 1819, and sentenced to be hanged—a fair beginning, which was not without its effect on their fellows in that city. "In consequence of the late condemnation of certain pirates at New Orleans, so many threats have been thrown out as to induce the Governor to order the volunteer companies to patrol the streets by night."[37] These sympathizers did not confine themselves to threats, according to the newspapers of a somewhat later date:

New Orleans. We have accounts from this city to the 24th ult. Numerous attempts to fire the town had been detected. The public mind was exceedingly agitated, on account of the threats made to release the pirates, at every hazard. There had been one alarming fire near the jail, and another at the arsenal, both of which did much damage. The latter endangered a great part of the city and shipping. One hundred barrels of powder were in the magazine, which was fire-proof; but six hundred muskets in the arsenal, strangely left loaded with ball cartridges, were destroyed. Happily they were stacked, so that they were discharged in the air. Twenty buildings were consumed on this occasion.[38]

Their colleagues at Galveston likewise felt the influence of these trials, as we may infer from the fact that on February 3, 1820, Commodore Patterson gave formal permission to Lafitte to withdraw from Galveston in peace to some foreign place. Lafitte lost no time in availing himself of this permission. On March 7, Lieutenant Lawrence Kearney, commanding the U. S. brig *Enterprise*, to whose tactful and competent hands the negotiations had been committed, was able to report the abandonment of Galveston.[39]

The 16 pirates in New Orleans were not alone in their questionable glory, for "we are informed from good authority that nearly

[36] N, January 8, 1820.
[37] N, January 15, 1820.
[38] N, June 17, 1820.
[39] H, 124.

30 convicts in the United States are at this time under sentence of death for piracy."[40]

None the less, the sinister record waxes without cessation, for, on March 16, the sloop *Brilliant* was boarded and detained 24 hours, near Cape Cruz, by two small schooner privateers. They also had the brig *William Henry* at anchor under Cape Cruz, which they had had in their possession three days, and had not determined what to do with her.[41] Again, on April 22, the ship *Jane*, Drummond, was boarded and robbed of $20,000 in specie, besides large quantities of stores, etc.[42]

Occasionally, but rarely, there is a compensatory success by our cruisers. The same paragraph which states that the ship *Cora* was plundered off Campeachy, adds that the U. S. schooner *Lynx*, Lieutenant Madison, "chased and overhauled the pirate schooner *Esperanza* of 25 tons and 24 men." The latter had "false papers." Of her disposition no record is available.

More to the point is the fact that three pirates were condemned to be executed in Boston on June 15; four were hanged at Charleston on May 12, and 18 were to be hanged on the 25th. Other executions were looked for at other places.[43] The lack of specific details in these notices is quite vexatious.

That slave ships took a hand in the piracies, when the opportunity favored, might have been expected. Such an instance is doubtless here reported:

> A Spanish Guineaman has lately committed acts of sheer piracy on two American vessels—plundering them in the most outrageous manner and maltreating their crew.[44]

Our shipping, caught between the upper mill-stone of privateering and the nether of piracy, seems to have been in a bad way. On June 24, the schooner *Martha*, Captain William Wild, of Troy, Massachusetts (sic) bound from St. Jago de Cuba to Philadelphia, was captured off the harbor of St. Jago by the Venezuelian (sic) privateer *Admiral Brion*, of 18 guns, commanded by Commodore Jolly, and sent for adjudication, after landing three of the crew at Cumberland Harbor[45] in the neighborhood.[46]

[40] N, March 25, 1820.
[41] NAV, No. 38-7.
[42] MWHP.
[43] N, May 27, 1820.
[44] N, June 17, 1820.
[45] Guantanamo.
[46] NAV, No. 38-9.

While pirates were chiefly active in the Gulf of Mexico, they did not hesitate to ply their trade farther afield, as they are reported to have been off the coast of Florida.[47]

As in the previous years, more vessels seem to have been lost during the warm months than during the winter, probably again because a number of our ships came north to escape yellow fever. The list of captures during this year is shockingly long.

Aug. 19—The brig *Clarissa*, Coffin, of Providence, was boarded off Point Yankos,[48] and plundered.[49]

Aug. 19—The ship *Orleans*, Snell, was boarded by a pirate off Abaco, and robbed of goods to the amount of sixty thousand dollars.[49 50]

Aug. 22—The brig *Mary Joan*, Purrington, was taken and plundered, the crew shockingly beaten, and lives threatened. Vessel given up.[49]

Aug. 25—The brig *Zealous*, Saunders, of Boston, was boarded by a pirate near Havana, and robbed.[49]

Aug. 28—The brig *Clarissa Ann*, Green, of New Orleans, was robbed off Cape St. Antonio, of goods to a large amount.[49 50]

Aug. 30—The schooner *Milo*, Hatch, was taken and robbed.[49 50]

The schooner *Experiment*, Paine, was boarded and robbed off Cape St. Antonio.[49]

The brig *Caledonia*, Warner, of Philadelphia, was plundered in the harbour of Havana of a number of articles.[51]

The *Ajax*, of Philadelphia, was robbed in the same place of one thousand dollars.[51]

Sept. 20—The brig *Mechanic*, Purrington, was boarded near Matanzas, and robbed. The captain was hung up three times, the mate twice, and the cook once, besides being bruised and stabbed in a shocking manner. The rest of the crew were more or less abused.[51]

The schooner *Milo*, of Bath, was taken at the same time and plundered.[51 52]

The brig *George*, of Boston, was taken and robbed; the crew abused.[51]

The brig *Collector*, of Rhode Island, was taken—the crew beaten and put on shore seven leagues from Havana.[51 53]

The schooner *Louisa*, Sherman, of Newport, was boarded off Matanzas, and robbed.[51]

Oct. 2—The schooner *Rebecca Ann*, Southcomb, of Baltimore, was boarded near Porto Rico, and robbed of cabin-stores, &c.[51]

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[47] N, August 5, 1820.

[48] Point Yacos?

[49] MWHP.

[50] Other authorities give this as 1821—see Intro., p. 10 for *Milo*, and p. 124, for *Clarissa Ann* and *Orleans*.

[51] MWHP.

[52] See preceding page. Possibly a second report of the same affair.

[53] See Intro., p. 10.

Oct. 8—The brig *Cobbosseecontee*, Jackson, was boarded near the Moro, and plundered; the mate beaten and hung until nearly dead, and the captain beaten and stabbed. Suffered to proceed.[53 54]

Oct. 16—The brig *Harriet*, Dimond, was robbed off Cape St. Antonio, of four thousand dollars in specie, and some of her cargo. The captain was hung till almost dead. Vessel given up.[53 54]

The schooner *Franklin*, Foster, was boarded and robbed by a pirate. The captain and crew were used in a savage manner. Vessel given up.[53]

The brig *Frances*, Drummond, was boarded by a pirate and robbed.[53]

Nov. 7—The schooner *Hiram*, Lambert, was plundered off Cape St. Antonio. Vessel given up.[53]

Nov. 7—The schooner *Mary*, Sutton, was robbed of her whole cargo, off Cape St. Antonio. Vessel given up.[55]

In comparison with such an array, the official report of naval operations in southern waters for this year is sorry enough reading. It is taken from a letter of Secretary Smith Thompson to the President of the United States, dated "Navy Department, December 27, 1820."

I have the honor to state, that, for the protection of our commerce in the West India islands, and parts adjacent, the brig *Enterprize*, of 14 guns, schooner *Nonsuch*, of 8 guns, schooner *Lynx*, of 6 guns, and Gun Vessels *Nos. 158* and *168*, have been, during the present year, constantly cruising in the Gulf of Mexico, among the West India Islands, and along the southern coast of Florida and the United States; and in addition to this permanent force, all the ships and vessels of war proceeding from the United States or returning to the same from the Mediterranean, coast of Africa, or elsewhere, have instructions to take their route through the West India Islands, to afford protection to our commerce in that quarter, and to give efficacy to the several acts of Congress for the suppression of the slave trade and capture of piratical vessels.[56]

A realization of the magnitude and steady growth of the depredations on our shipping is complacently lacking from this official statement. Piracy was indeed on the upward curve. A brig here, a schooner there, a few gunboats now and then and a perfunctory stop in the West Indies by our men-of-war returning from abroad, were about as effective as a teacup full of water thrown upon a burning dwelling. The American people had to be thoroughly irritated before demanding of the government that piracy be crushed. We hear the same story at practically every crisis in our national life.

[54] Other authorities give this as November, 1821.
[55] MWHP.
[56] NAV, No. 38-5.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE CONSTANT BEARING

ITS THEORY AND APPLICATION

By Lieut. Commander Richard Drace White, U. S. Navy

One of the best known principles of seamanship is that when two ships are approaching each other they will, if the bearing does not change, eventually come into collision. It is the best known, perhaps, because it is the one most frequently had recourse to. In fact, it is almost habitual with the bridge officer to observe, as soon as a sail is sighted, whether or not it changes its bearing. Generally there is a feeling of relief if the bearing is found to be changing, for that practically assures that the visitor will go clear without any action being taken on the part of either. However, there are times when one does not want the bearing to change; and those are the times in which this paper is interested.

For example, if in intercepting you find that the bearing of the objective does not change, you have the assurance that your course is the one that will bring you up soonest with the speed in use. If when firing at a moving target, wind or sunlight make it advantageous to keep the target in a certain direction, you know that you are maintaining the desired position only when the bearing does not change. Generally speaking, if you are maneuvering to attain a certain position but are uncertain what to do, the maintenance of a fixed bearing for a time gives you a chance to decide what you really want to do, without suffering that helpless feeling which comes of seeing things happen which you do not want to happen—happen fast and in overwhelming variety.

The theory of the constant bearing is very simple. Referring to Fig. 1, consider a ship at A, on a course AB, having a distant object C, in the line AC. Consider that in a certain increment of time A moves to the point b. The element of A's movement which is projected on the line XY, perpendicular to AC, is the factor of

A's movement that tends to make the bearing of *C* change. This factor is represented as *Ax*. It is *A's* movement multiplied by the cosine of the angle *BAX*, or by the sine of the angle *BAC*. Enunciating the foregoing as a principle, it is *A's* movement multiplied by the sine of the angle of *C* from *A's* direction of movement.

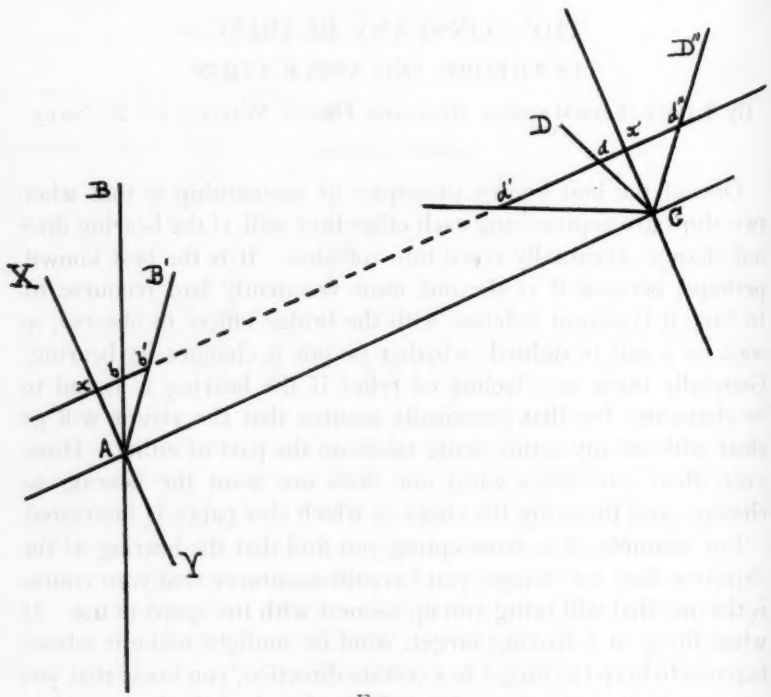

FIG. 1

Suppose that in the same increment of time as we have considered above, the object *C* moves on such a course and at such a speed that the projection of its movement on the perpendicular to the line bearing is *Cx'*, which equals *Ax*. Then it is evident that, so far as the movement of *A* and *C* are concerned, there is no tendency to change bearing.

That this is a condition often to be sought as well as avoided, I have already remarked. The following examples show its usefulness. Some of them have frequently been made use of by the author, always with satisfying results.

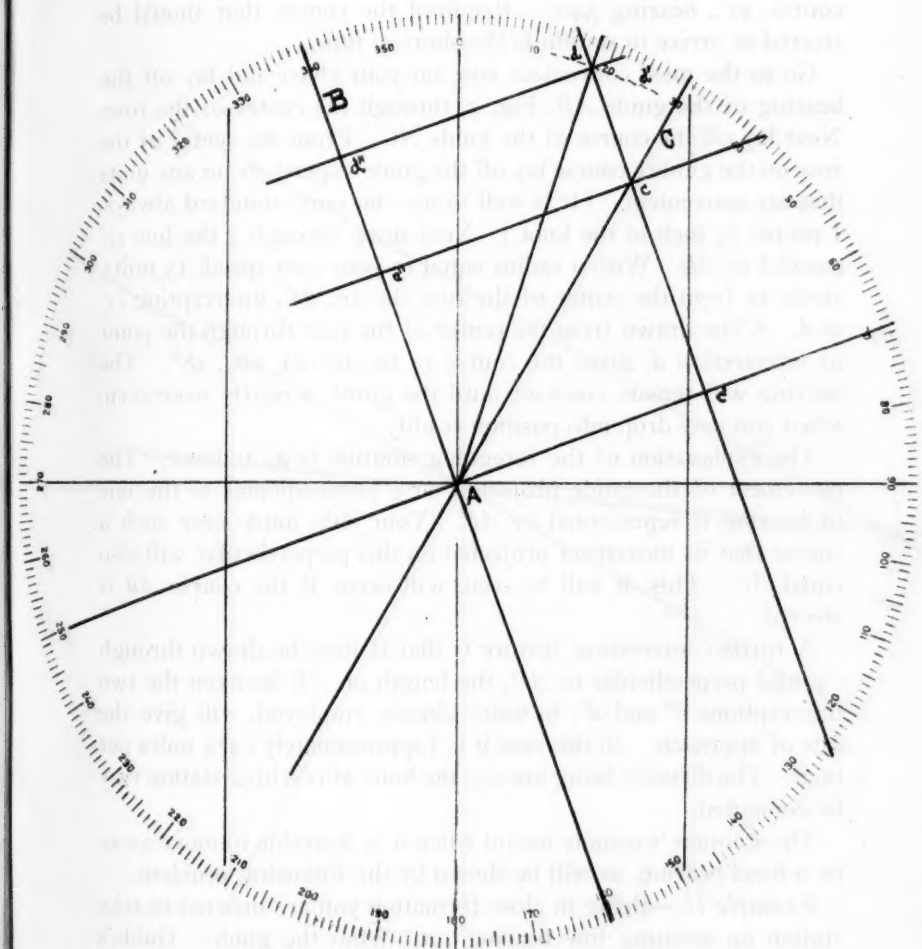
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FIG. 2

Example I.—Your ship is maneuvering free. You are ordered to take position next astern of another ship which we will call the guide. Your speed is 15 knots. The speed of guide is 12 knots; course 30°, bearing 340°. Required the course that should be steered to arrive in station in the shortest time.

Go to the most convenient rose on your chart and lay off the bearing of the guide *AB*, Fig. 2, through the center of the rose. Next lay off the course of the guide *AC*. From the center of the rose on the guide's course lay off the guide's speed *Ac*, in any units that are convenient. (It is well to use the same standard always. I prefer ¼ inch to the knot.) Next draw through *c* the line *cc'* parallel to *AB*. With a radius equal to your own speed, 15 units, strike in from the center of the rose the arc *dd'*, intercepting *cc'* at *d*. A line drawn from the center of the rose through the point of intersection *d*, gives the course to be steered, viz., 18°. The bearing will remain constant until the guide is nearly overtaken, when you may drop into position readily.

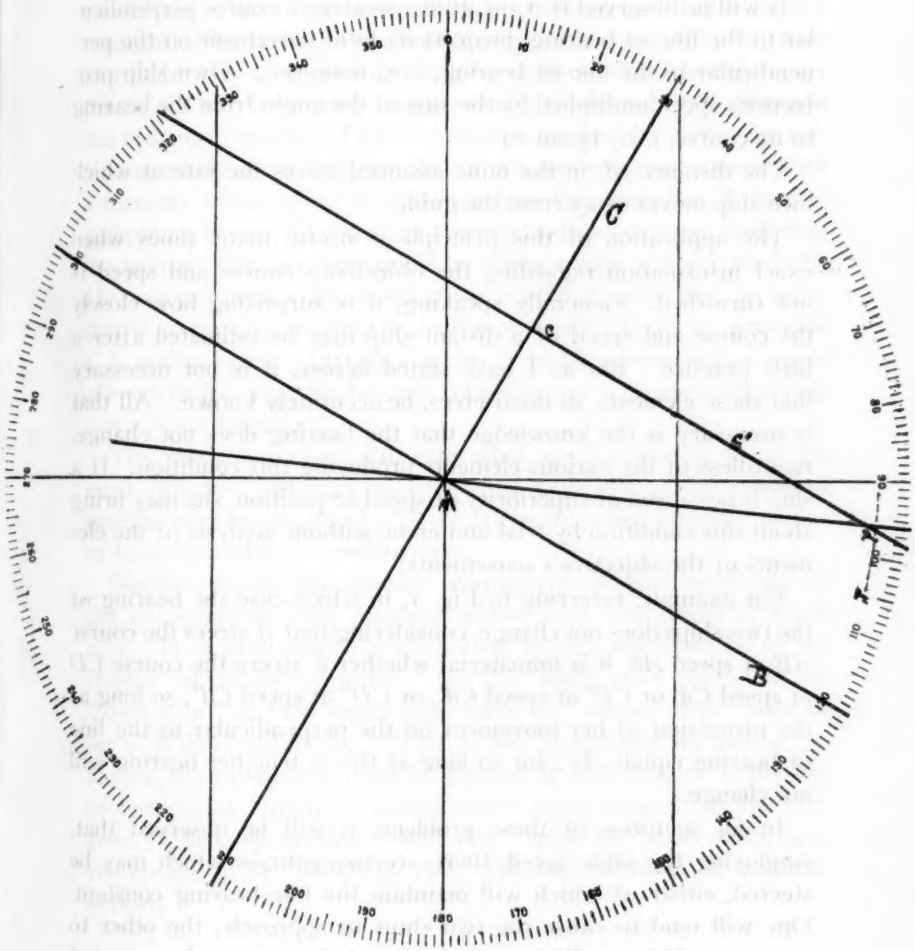
The explanation of the foregoing solution is as follows: The movement of the guide projected on a perpendicular to the line of bearing is represented by *Ac'*. Your ship must steer such a course that its movement projected on this perpendicular will also equal *Ac'*. This, it will be seen, will occur if the course *Ad* is steered.

A further interesting feature is that if lines be drawn through *c* and *d* perpendicular to *AB*, the length on *AB* between the two interceptions *c''* and *d''*, in units already employed, will give the rate of approach. In this case it is (approximately) 4⅛ miles per hour. The distance being known, the hour of reaching station may be computed.

The solution is equally useful when it is desirable to move away on a fixed bearing, as will be shown by the following problem.

Example II.—Being in close formation you are ordered to take station on scouting line bearing 120° from the guide. Guide's course 30°, speed 6 knots. Own speed, 15 knots. Required, the course to be steered to gain station in the shortest time.

Go to the most convenient rose and lay off the bearing, *AB*, Fig. 3, through the center of the rose. Next lay off the course of the guide, *AC*. From the center of the rose lay off the guide's speed *Ac* in the standard units. Draw through *c* the line *cc'* parallel to *AB*. With a radius equal to your own speed, 15 units, strike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330
340
350

FIG. 3

in the arc dd' intercepting cc' at d. A line then drawn from the center of the rose through d gives the course to be steered, viz., 96°.

It will be observed that the guide, steering a course perpendicular to the line of bearing, projects its total movement on the perpendicular to the line of bearing, *i. e.*, 6 sin 90°. Own ship projects its speed multiplied by the sine of the angle from the bearing to its course, *i. e.*, 15 sin 24°.

The distance cd, in the units assumed, gives the rate at which own ship moves away from the guide.

The application of this principle is useful many times when exact information regarding the objective's course and speed is not furnished. Generally speaking, it is surprising how closely the course and speed of a distant ship may be estimated after a little practice. But as I have stated before, it is not necessary that these elements, in themselves, be accurately known. All that is necessary is the knowledge that the bearing does not change, regardless of the various elements producing this condition. If a ship is possessed of superiority of speed or position, she may bring about this condition by trial and error without analysis of the elements of the objective's movements.

For example, referring to Fig. 1, in which case the bearing of the two ships does not change, considering that A steers the course AB at speed Ab, it is immaterial whether C steers the course CD at speed Cd, or CD' at speed Cd', or CD'' at speed Cd'', so long as the projection of her movement on the perpendicular to the line of bearing equals Ax; for so long as this is true her bearing will not change.

In all solutions of these problems it will be observed that, employing the same speed, there are two courses which may be steered, either of which will maintain the line bearing constant. One will tend to cause the two ships to approach; the other to separate. This condition may frequently be taken advantage of when it is desirable to remain on a fixed bearing from an objective outside of certain limits of range without altering speed. For example, there is frequently a restriction in target practice instructions forbidding a ship to approach a target on certain bearings. A simple plan is to choose a safe bearing and work in and out on it until it is time to make the approach.

It will be seen, referring to Fig. 1, that the ship A maintains the bearing of C constant by steering in the line AB at speed Ab. Being assured that the bearing is maintained constant under these conditions, A may rest confident that the bearing will also remain constant, if he steers on the course AB' at the rate Ab'. In other words, for any speed you may employ (provided it is not too low) there is a corresponding course which, if steered, will maintain the bearing constant. This fact may be profited by under the following conditions: Suppose that A is a torpedo craft armed with a torpedo whose speed is equal to Ab'. Suppose that A, having sighted an enemy C, and after steering various courses, finds that the bearing remains constant if he steers course AB at speed Ab. He does not need to know either the course or speed of C to know that if he runs his torpedo in the direction AB' it will hit, provided C is within range. In fact, the run in on the course AB at speed Ab, which has kept the bearing constant, has been virtually a *trial run for his torpedo.*

The foregoing cases illustrate what are considered to be the most common instances in which the principle of the constant bearing may be employed. There are many others equally capable of being solved by its employment.

Needless to say, the solution is greatly facilitated by the use of the universal drafting machine where such instrument is available. It is also very quickly solved by the employment of the change of range projector. In this latter case the speed of "own ship" and the speed and course of "enemy ship" must be set as is done ordinarily. Then, in lieu of sighting directly at the enemy, the instrument must be sighted at right angles to the line of bearing of "enemy," special vanes being rigged for the purpose. Then, by turning "own ship" until the scale reads zero, the course to be steered by own ship may be read off instantaneously.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

COMPASS CORRECTIONS

By LIEUTENANT JOAQUIN HERRERA, Chilean Navy

I intend showing a method to correct Courses and Bearings in a very simple way, in which it is not necessary to trouble about the quadrant of the Course to give it the sign, and whether it is to be changed or not.

All seamen know how difficult it is to learn to correct Courses with the necessary security and rapidity to do it at once and without hesitation. The advantage of this method is to avoid all thinking, working everything at sight with the data given, and thus getting a complete security in the result.

All that we have to remember are the following simple rules:

Call the *True Course* always..... +
" " *Compass Course* always..... —
" " *same* denominations (N. & N., S. & S., E. & E., W. & W.) always..... +
" *different* denominations (N. & S., E. & W.) always ..... —

1. Suppose we want to know the *Compass Course* from the Magnetic Course.

Magnetic Course ..... = S. 12 W.
Deviation ..... = 2 NE.
Compass Course ..... =

Applying the above rules we say:

Compass Course ..... = —
Course *W.* and deviation *E.*..... = —
" *S.* " " *N.* ..... = —

} = —

Combining these three signs we get (—) which means the result will be:

Compass Course = *S. 10 W.*

2. To find the *Magnetic Course* from the Compass Course.

Compass Course ..... = N. 18 W.
Deviation ..... = 4 NE.
Magnetic Course ..... =
Compass Course is (—), then Magnetic Course will be..... = +
Course *W*. and Deviation *E*. ..... = —
" *N*. " " *N*. ..... = +
} = —

Combining these three signs we get as

Magnetic Course = *N*. *14 W*.

3. To find the *True Course* from the Magnetic Course.

Magnetic Course ..... = N. 48 E.
Variation ..... = 12 NW.
True Course ..... =
True Course ..... = +
Course *E*. and Variation *W*..... = —
" *N*. " " *N*. ..... = +
} = —

True Course = *N*. *36 E*.

4. To find the *Magnetic Course* from the true Course.

True Course ..... = S. 38 W.
Variation ..... = 6 NE.
Magnetic Course ..... =
True Course is (+), then Magnetic Course will be..... = —
Course *W*. and Variation *E*..... = —
" *S*. " " *N*..... = —
} = —

Magnetic Course = *S*. *32 W*.

DISCUSSION

LIEUTENANT COMMANDER E. B. FENNER, U. S. Navy, Head of Department of Navigation, U. S. Naval Academy.—Lieutenant Herrera's method is a most ingenious analytical generalization of the various thumb rules that are commonly used in applying deviation and variation to courses when the Compass Card is marked by quadrants and is the only purely analytical method I have ever seen for handling that problem. The marking of deviation and variation NE and NW instead of E and W differs from our practice, but it appears to be necessary under the rule given and is in no way confusing.

With the Compass Card marked in quadrants, probably the commonest error in navigation, and certainly one of the most serious, is the misapplication of compass errors. The use of a Compass Card marked continuously from 0° to 360°, now standard in our service, does away with the whole difficulty and Lieutenant Herrera's rule reduces to the following:

Mark Compass Course +, True Course —,
Easterly Variation or Deviation +,
Westerly Variation or Deviation —.

Combine according to signs and drop the sign of the resultant course. Obviously this rule is so simple that its mental application is free from danger.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TALE OF A SEA-GOING PEACH PIE

By SURGEON M. S. GUEST, U. S. Navy (Retired)

I believe Admiral Clark, commander of the *Oregon* at Santiago, is responsible for the following yarn. It was recalled to me lately by another old "Sea Dog," and, as there may be some who have not heard it, I venture to offer it:

A good many years ago one of our old sloops of war was heeling to a good breeze the second day out from the Capes of Chesapeake; the afternoon watch had just been piped on deck when the presence of the first lieutenant was requested at the "mast" to settle the cases of two men brought up by the master-at-arms for fighting. One of the men was pretty badly battered, and it was to him the executive officer first turned his attention, somewhat after this fashion:

"Well, my man, what is your name and how did you come by that black eye?"

"My name, sir, is Tom Jones, sir, and I'm a berth-deck cook by ratin', sir. Bill Trigger here, sir, is the captain of the fo'castle, sir, and him and me is mess mates, sir, and we goes into cahoots for to make a pie, sir, when we gets to sea. I bein' a cook, sir, agrees to make the pastry, sir, and do the cookin', while Bill agrees to get the can of peaches off'en the bumboat afore we leaves port, sir. Well sir, he done it and I done it, and comes mess gear, I calls Bill to come and get his share o' the pie. Well you see, sir, we be heeled considerable to the breeze, sir, and I has some trouble keepin' the pans in the galley stove, sir; but I makes the pie, sir, and calls Bill like I said, sir. Bill 'e comes, sir, and I takes my knife and cuts the pie fair down the 'midship line, sir. Well then, sir, I sits down on my mess chest, sir, for to eat my pie, when Bill comes and hits me on the head, sir, and knocks my pie into the waterways, sir."

" Now Trigger, what have you to say to this? " asked the " first luff."

Says Trigger: " Yes, sir, it's just like Jonesy said, sir; 'im and me goes into partners, sir, to make a pie when we gets clear o' the land, sir, and our fresh grub is gone, sir. 'E bein' a cook, sir, agrees to make the casin', sir, and do the cookin', while I takes on to furnish the can o' peaches, it bein' a peach pie, sir. Well sir, 'e makes the pie, sir, and calls me down at mess gear to get my 'alf and 'e takes a knife and cuts 'er fair fore and aft in two as near as may be; the ship bein' 'eeled over some, sir, just like 'e said, sir, and 'e goes and sits down on 'is mess chest, sir, to eat 'is piece o' pie, but damn 'is bloody 'eart and eyes, sir, 'e give me the weather side o' the pie and 'e gets all the peaches, sir, 'er ballast 'avin' shifted on the galley stove, sir. So I 'ad to 'it 'im, sir."

DISCUSSION

The Fleet Submarine

(See Page 1815, Whole No. 166)

Lieutenant R. S. Edwards, U. S. Navy.—To Lieutenant Daubin's well-considered plea for larger submarines I would add the no small advantage of better living conditions on the larger boat. Those whose sea service includes the old "coast defence" torpedo-boat or a small submarine will, I think, agree that the exhaustion of the crew from poor facilities for eating and sleeping causes poor work, slow work, and stupid work; and that, within limits, the larger and the more comfortable the craft the more effective will be the efforts of the crew. But the "Fleet Submarine"! When the torpedo-boat was banished the destroyer was there for all to see; when the mixed main battery became an object of suspicion its opponents gave us an idea of what the all big gun battleship would be; and now when we are asked to cast forth the small submarine may we not reasonably ask "what is the fleet submarine?" Lieut. Daubin's article is of timely value as the thoughtful expression of an experienced officer on a live issue, and I think more such articles would be welcomed by those who have had no submarine experience to help them form an opinion on the relative merits of the two types—the large and the small; but we must know what the argument is about and I suggest that now is the time for the designers to tell us what the fleet submarine will be when it is built.

MINUTES OF THE ANNUAL MEETING, 1916

U. S. Naval Academy, Annapolis, Md.,
October 13, 1916.

In accordance with Article V, Section 1, of the Constitution, two weeks notice having been given, the annual meeting was held at the Board Room of the Officers' Mess at 8.20 p. m.

Captain L. M. Nulton, U. S. Navy, member of the Board of Control, presided, there being 14 members present.

The minutes of the last annual meeting were read and approved.

The stated business being the election of officers, the following tellers having been appointed by the Vice-President 10 days previous—

Commander J. J. Raby, U. S. Navy,
Lieut. Commander R. Wainwright, Jr., U. S. Navy,
Lieutenant R. S. Edwards, U. S. Navy,

reported the results of the balloting to the meeting and declared the following named officers elected for the ensuing year, 1916-1917:

President

Rear Admiral B. A. Fiske, U. S. Navy.

Secretary and Treasurer

Lieut. Commander J. W. Greenslade, U. S. Navy.

Board of Control

Chief Constructor D. W. Taylor, U. S. Navy.
Colonel J. A. Lejeune, U. S. M. C.
Captain L. M. Nulton, U. S. Navy.
Commander W. T. Cluverius, U. S. Navy.
Lieut. Commander J. Halligan, U. S. Navy.
Lieutenant Byron McCandless, U. S. Navy.

The Secretary and Treasurer read his annual report as follows:

1. The interest in naval affairs, caused by the war in Europe and the preparedness movement in this country, has continued

during the past year as shown by the steadily increasing list of regular memberships and the rapidly increasing list of associate memberships. Applications for membership from those who participated in the recent volunteers' cruise have just begun to come in; they promise an unusual growth for the coming year.

2. The present circulation of the Institute PROCEEDINGS is 3258, divided as follows:

	5	honorary memberships,
	136	life memberships,
	1877	regular memberships,
	518	associate memberships,
	549	subscribers,
	7	subscribers, enlisted men,
	104	exchanges,
	31	advertisers, and
	31	newspapers and periodicals.
During the year...	7	life,
	356	regular, and
	182	associate members have joined.
A total of	545	
Resignations,	24	
Deaths.....	23	
Dropped....	1	
	— 48,	
An increase of..	497	for the year. Subscribers have increased 51 over last year.

3. At its regular meeting of October 5, 1916, the Board of Control decided to have the PROCEEDINGS published in monthly form after January 1, 1917. This change will have the result of bringing articles and professional and international notes of a timely nature to members before public interest in them has had a chance to die out; in addition, the reception of the PROCEEDINGS oftener, but in reduced size, should make their perusal a matter of more interest, easier to undertake. The cost of producing the PROCEEDINGS in monthly form, reduced to approximately half the present size, will not be much greater than that of getting out the present bi-monthly issue; it is estimated that the increased cost will not amount to more than $1500, including the increase of postage. Furthermore, increase in advertising matter and increasing subscriptions will reduce this margin of loss.

4. During the past year the average issue has been 3450 copies of each number, at an average cost of $2094 per issue; the total cost of the six issues being..... $12,564

Receipts from PROCEEDINGS for year have been:

2531 members at $2.00 each	$5,062	
556 subscribers at $3.00 each	1,668	
Miscellaneous sales of PROCEEDINGS	360	
Advertisements	853	
Interest on $7443 life fees	273	
		8,216
Total loss on PROCEEDINGS for the year		$4,348

The sale of books and interest on money invested make up the deficit and leaves a profit for investment, after paying office expense, salaries, etc.

Estimated cost per year to issue PROCEEDINGS monthly	$14,064
Total receipts from PROCEEDINGS at present	8,216
Estimated loss on monthly issue	$5,848

Estimated cost to produce 1000 extra copies, $1800. Number of members at $2.00 each to offset loss, about 29,000. If dues were increased to $3.00 per year, receipts from PROCEEDINGS would be:

2531 members at $3.00 each	$7,593	
556 subscribers at $3.00 each	1,668	
Miscellaneous sales of PROCEEDINGS	360	
Advertisements	853	
Interest on $7443 life fees	273	
		$10,747
Estimated cost per year to issue PROCEEDINGS monthly		$14,064
Estimated loss with dues increased to $3.00		3,317

Estimated cost to produce 1000 extra copies, $1800. Additional number of members at $3.00 each to offset loss, 2750.

5. During the year the following changes in personnel of officers of the Institute have occurred:

Board of Control

Appointed

Comdr. Ralph Earle	vice Capt. L. H. Chandler, res., detachment.
Lieut. Byron McCandless	vice Comdr. J. T. Tompkins, res., detachment.
Lt. Comdr. J. Halligan,	vice Comdr. J. R. P. Pringle, res., detachment.
	Comdr. Ralph Earle, res., detachment.

Secretary and Treasurer

Lt. Comdr. J. W. Greenslade, vice Lt. Comdr. B. C. Allen, res., detachment.

6. The Prize Essay for 1916 was won by Lieutenant H. H. Frost, U. S. Navy; the Honorable Mention Essays were by Lieut. Commander J. K. Taussig, U. S. Navy; Lieutenant Ridgely Hunt, U. S. Navy, and Commander D. W. Knox, U. S. Navy. Permission to publish Lieut. Commander Taussig's essay was refused by the Navy Department. Twenty-two essays were submitted.

7. At the request of Mr. Walter Lippincott and with the approval of the Navy Department, the Board of Control conducted the Lippincott Prize Essay Contest during the past year, the results of which have been announced in the Institute PROCEEDINGS; the prize-winning essay and one representing the opposite point of view having been published. Fifty-four essays were submitted in this contest.

8. The following books have been corrected and reprinted:

Bluejacket's Manual,
Landing Force and Small-Arm Instructions, and
Deck and Boat Book.

The following books have been reprinted:

Ship and Gun Drills (1914),
Recruit's Handy Book,
Electrician's Text Book (Vol. 2),
Practical Manual of the Compass, and
Navigation and Compass Deviations.

Contract was entered into with P. A. Surgeon R. G. Heiner, U. S. Navy, and the first edition of his book "Physiology, First Aid and Naval Hygiene" has been printed and placed on sale; contract has also been made with Lieut. Commander G. J. Meyers, U. S. Navy, for his book "Marine Turbines, U. S. Navy," and requests for bids have been sent out, the bids to be opened Saturday, 14th instant. Contract has been given for revising "School of the Ship," which is to be ready January 1, 1917; and officers of the Department of Electrical Engineering are now revising Volume I of "Naval Electrician's Text Book," and re-writing Volume II. A new edition of both volumes will be printed in the summer of 1917.

9. The advertising was taken from the agency on July 1 last and is now being handled by the Institute direct; thus far contracts for $215.00 worth of new advertisements have been closed.

10. Suit has been filed in the Supreme Court of the District of Columbia against the Washington Loose Leaf Company for infringement of copyright of the "Recruit's Handy Book," and for an accounting and injunction. All copyrights of the Institute are now being taken out in the name of a trustee appointed by the Board of Control for the reason that the Naval Institute had no legal title whatever in any of the copyrights on its books, as they had been taken out in the name of the Secretary and Treasurer serving at the time of publication. It was considered essential to transfer the various copyrights involved to a trustee appointed by the Board of Control.

11. Enlisted men, not being eligible for membership in the Naval Institute, may now, by the action of the Board of Control, subscribe to the PROCEEDINGS for the same price as is paid in for dues by members.

FINANCIAL STATEMENT

Total receipts from 1 Oct., 1915, to 30 Sept., 1916		$48,521.69
Balance on hand 1 Oct., 1915		14,737.44
Total		$63,259.13
Total disbursements for the year		46,233.89
Balance on hand 1 Oct., 1916		$17,025.24

ASSETS

Bills receivable for dues	$1,046.00	
Bills receivable for text-books	6,164.54	
Bills receivable for advertisements	120.86	
		7,331.40
Total		$24,356.64

LIABILITIES

Lord Baltimore Press	$3,140.96	
Newsdealers, expressage, etc.	124.24	
		3,265.20
Balance		$21,091.44
On hand 1 Oct., 1915		16,181.03
Increase of balance over last year		$4,910.41

This increase represents in no way the increase in value of the Institute, as this report does not include an inventory of all assets, which will appear on the regular Annual Report. A rough estimate of the extra publications on hand at the cost of printing is $11,000, a decrease of $2100, leaving a net increase in the value of the Institute of $2800.

The following persons were duly elected life or associate members of the Institute:

ASSOCIATE MEMBERS

Sperry, L. P., Mr.
Hutchinson, M. R., Mr.
Wood, Henry A. Wise, Mr.
Rivera, Juan, Lieut. Cuban Navy.
Plunkett, R. A. R., Comdr. Brit. Navy.
Chalmers, W. S., Lieut. Brit. Navy.
Nowell, Jos. C., Lieut. Mass. N. M.
Foss, Wendell, Lieut. Wash. N. M.
Alger, J. A., Lieut. U. S. C. G.
Coakley, Morgan T., Mr.
Wright, Frank G., Lieut. Mass. N. M.
Ramsay, W. W., Lieut. Mass. N. M.
Downing, A. C., Mr.
Scofield, J. A., Mr.
Woodbine, A. H., Lieut. Comdr. Cal. N. M.
Adams, Morgan, Lieut. Cal. N. M.
Tipton, M. R., Ensign Cal. N. M.
Hageman, Al., Ensign Cal. N. M.
Haver, H. M., Ensign Cal. N. M.
Simpson, Frank, Ensign Cal. N. M.
Graham, G. B., Lieut. Comdr. Fla. N. M.
Cooke, John W., Mr.
Ross, Thos. W., Mr.
Thomas, Houston A., Mr.
Isbester, G. C., Lieut. Comdr. Ill. N. R.
Williams, D. Evans, Mr.
Hicks, Harry W., Dr.
Hannah, Fred. A., Mr.
Mason, Harold F., Mr.
Saltonstall, Richard, Mr.
Waller, Stewart, Mr.
Smith, Augustus, Mr
Chapin, Robt. C., Mr.
Lowe, Justus F., Mr.
George, Howard E., Mr.
James, Dean K., Mr.
Hooper, Jas. R., Mr.
Bissell, H. C., Mr.
Wright, Wm. T., Mr.
Scott, Henry R., Mr.
Auchincloss, Hugh D., Mr.
Connelly, Paul A., Mr.
Easterbrooks, Wm. Y., Mr.
Goff, Paul W., Mr.
Holman, Wm. W., Mr.
Hughes, Geo. F., Mr.
Jackson, D. C., Mr.
Jarvis, Van Buren, Mr.
Johnson, M. E., Mr.
Knight, T. S., Mr.
Knowlton, Benj. A., Mr.
Leet, Leslie N., Mr.
Leviseur, F. J., Mr.
Loring, Caleb, Mr.
McKenney, W. R., Mr.
Mellen, Wm. H., Mr.
Meyer, Wm. H., Mr.
Morgan, David P., Mr.
Nichols, Chester L., Mr.
Noyes, R. B., Mr.
Parkinson, John, Jr., Mr.
Perry, Frank B., Mr.
Pierce, Edgar, Mr.
Powel, T. I. Hare, Mr.
Rand, Wm. M., Mr.
Read, Chas. N., Mr.
Simonds, Sidney L., Mr.
Sinclair, W. F., Mr.

Hall, Chas. Ward, Mr.
Cathcart, Wm. L., Mr.
Aiken, Alfred L., Mr.
Fessenden, R. A., Mr.
Frothingham, Thos. G., Mr.
Babcock, Franklin, Lieut. U. S. A.
Guimera, Francisco, Lieut. Cuban Navy
Sage, Darrow, Lieut. New Jersey N. M.
Starr, J. A., Lieut. U. S. C. G.
Wheelwright, John T., Mr.
Loud, Chas. E., Mr.
Lawrence, John S., Mr.
Belsley, Ben, Lieut. Ill. N. R.
Horney, Odus C., Mr.
Higashima, I., Comdr. Japanese Navy
Migita, K., Comdr. Japanese Navy
Janney, Reynold, Mr.
Benson, Arthur F., Mr.
Crocker, Paul, Mr.
Churchill, W. W., Mr.
Thatcher, G. I., Lieut. U. S. Army
Sheridan, Thos. W., Mr.
Brigham, Chas. H., Mr.
Phelan, John J., Mr.
Lawyer, Fred C., Mr.
Jones, Theo., Mr.
Calder, Jas., Mr.
Pluymert, N. J., Mr.
Brown, Edwin, Mr.
Goddard, E. S., Mr.
Swift, Justin R., Mr.
Whittall, Matthew P., Mr.
Satterlee, Chas., Capt. U. S. C. G.
DeWitt, Geo., Mr.
Thayer, Geo., Mr.
Knowles, John A., Mr.
Blake, Robt. Fulton, Mr.
Hopkins, Samuel A., Dr.
Link, G. E., Lieut. Cal. N. M.
Vandergucht, J., Lieut. Cuban Navy
Savage, A. H., Mr.
Bagby, R. B., Mr.
Hankison, Otto L., Ohio N. M.
Morris, D. M., Mr.
Upton, Roger, Mr.
Lockwood, H. de F., Mr.
Agassiz, Rudolph L., Mr.
Clark, Henry C., Mr.
Willey, Jas. H., Comdr. Cal. N. M.
Tosu, T., Comdr. Japanese Navy
Chu, T. S., Chinese Navy
Schraidt, Ferdinand, Mr.
Howard, D. S. H., Mr.
McKenzie, Donald, Lieut. Md. N. M.
Sprague, Henry B., Mr.
Tileston, Roger, Mr.
White, Jas. C., Mr.
Wilkinson, Everett R., Mr.
Wing, G. H. G., Mr.
Worthington, Nicholas, Mr.
Skillings, J. K., Mr.
Rittenhouse, E., Mr.
Parkman, Henry, Mr.
King, Hervey W., Mr.
Burke, Wm. A., Mr.
Frost, H. H., Jr., Mr.
Chapman, W. H., Mr.
Barnes, Cyrus, Mr.
Willien, L. J., Mr.
Morgan, Junius S., Jr., Mr.
Williams, C. G., Mr.
Cunningham, Stanley, Mr.
Russell, R. S., Mr.
Britten, F. A., Hon.
Clapp, H. Rowland, Mr.
Faller, Guy W., Mr.
Yeaman, Caldwell, Mr.
Warren, Philip L., Mr.
Patterson, Wistar E., Mr.
Bernheimer, Clement M., Mr.
Anderson, Rand, Mr.
Boyd, F. R. C., Mr.
Howe, Jas. A., Mr.
Evans, E. R., Mr.
Shipton, J. A., Lieut. Col. U. S. A.
Iselin, Wm. O'D., Mr.
Forbes, Alexander, Mr.
Proctor, Jas. H., Mr.
Proctor, Thos. E. 2d., Mr.
Stahl, H. E., Jr., Mr.
Bonner, Jas. B., Mr.
Price, Geo. M., Ensign Wash. N. M.
Farley, Jos. F., Lieut. U. S. C. G.

Derby, W. N., Lieut. U. S. C. G.
Harris, T. W., Lieut. N. Y. N. M.
Matheis, A., Lieut. U. S. C. G.
Craven, Alfred, Mr.
Risberg, Gustaf, Comdr. Swedish Navy
Foord, Jas. L., Mr.
Weymouth, W. M., Lieut. Maine N. M.
Tsutsumi, Masao, Lieut. Japanese Navy
Lund, Henry J., Ensign Mass. N. M.
Ingraham, K. C., Ensign Wash. N. M.
Donahue, J. P., Rt. Rev., D. D.
McIntosh, Earle, Maine N. M.
Stetson, Paul H., Mr.
Belknap, Henry W., Mr.
Adams, Chas. F., Mr.
Blake, Arthur, Mr.
Yamamoto, K., Japanese Navy
Tarbell, Arthur P., Mr.
Foster, C. H. W., Mr.
Hoyt, Fred. W., Mr.
Eto, K., Comdr. Japanese Navy

LIFE MEMBERS

Shattuck, Henry L., Jr., Mr.
Emerson, Raffe, Mr.

The Secretary and Treasurer presented for the consideration the following

DRAFT OF SUGGESTED CHANGES TO THE CONSTITUTION

Article VII, Section 7.—To read as follows:

Associate members and life members, other than those entitled to regular membership, shall be elected as follows:

Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the Naval Institute.

Article VII, Section 8.—In second line change "two dollars" to "two dollars and fifty cents" or "three dollars." In the fourth line change "thirty" to "forty."

Article VII, Section 9.—To read as follows:

No member of the Institute shall be dismissed except by recommendation of the Board of Control, and by a two-thirds vote of the members of the Institute voting at any regular or called meeting, of which at least two months' notice shall be given; members of the Institute must be given an opportunity to vote on a ballot mailed by the Secretary and Treasurer at least two months before the meeting in question. Without the recommendation of the Board of Control, no member can be dismissed except by a three-fourths vote. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues.

Article X, Section 6.—Strike out the words "the Secretary and Treasurer" and substitute the words "a trustee appointed by the Board of Control."

Article XII.—Strike out the last two sentences and add:

Notice of proposed changes or additions, together with a form of ballot on same, shall be mailed by the Secretary and Treasurer to each life and regular member at least two months before action is taken.

The meeting rejected the suggested change to Article VII, Section 8, but voted to present for the consideration of the Institute, in accordance with the Constitution, the suggested changes to Article VII, Section 7, Article VII, Section 9, Article X, Section 6, and Article XII. It was ordered by the meeting that the wording of all suggested changes should be considered and approved by the Board of Control before presentation to the membership for decision. It was moved and carried that it be considered the sense of the meeting that, in consideration of the great amount of work imposed on the members of the Board of Control by their routine duties, all members should receive ten dollars ($10) for each regular monthly meeting attended, and in addition, members who have to undergo expenses for travel should receive reimbursement therefor.

There being no further business for presentation, the meeting adjourned at 9.50 p. m.

J. W. GREENSLADE,
Lieut. Commander, U. S. Navy,
Secretary and Treasurer.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Monthly Institute Proceedings

The Board of Control having decided to publish the PROCEEDINGS of the United States Naval Institute monthly, has ordered the issue of the first number in that form for January 1, 1917. The amount of material to be published in each issue willl not be greatly increased, the object of the change being to place timely articles and the War Notes before members and subscribers at more frequent intervals, and nearer the dates to which they refer.

A Note to Regular Members

Examination of our files shows that sixty-two per cent of all line officers of the service are members of the Naval Institute. While this might seem creditable, conversion to the Naval Academy scale gives but a bare 2.50 as the mark they receive in the subject "Support of the Institute," when there is no valid reason why they should not "star."

If it is granted that the Institute is fulfilling—even to a slight degree—its object of advancing professional, literary and scientific knowledge in the navy, then it must also be granted that the obligation of every one in the service to become an active supporting member is undeniable.

The reason then that the Institute needs all the support the service can give is a more weighty one for becoming a member than is the consideration of individual benefit received from the receipt of the PROCEEDINGS and Institute publications.

Inspection of the Secretary's Annual Report, which follows the notes, will reveal that the Institute, under its present membership dues, can never hope to become absolutely self-supporting; and, with the inception of the monthly issue of the PROCEEDINGS, the annual deficit will become greater unless the membership is largely increased. The growth of the Institute in the past two years has been rapid, but this increase should be but the forerunner of the

great expansion which the members of the Institute themselves should bring about. Advertising and letter writing have their place, but there is nothing so persuasive as the spoken word, nothing so clinching as an ocular demonstration, nothing so convincing as the recommendation of a friend.

The Institute is not a technical, line-officer's journal; it is the medium for the expression of service thought and opinion. There is not room in the PROCEEDINGS for the mere technical details and design of ordnance and engineering equipment; for the intricacies of general storekeeping; for the instructions for marking clothing or the conduct of Swedish exercises; for the minute particulars of surgical operations; or for a personal and social column.

The Institute aims to present material which is for the general interest and education of every one in the naval service, the militia, the reserve and the body of civilians interested in the service. The Institute's increased support then must come from the following sources:

The commissioned personnel of the navy and marine corps as regular members,

The enlisted men of the regular service, who may become subscribers, the subscription being the same as dues for members,

The coast guard, naval militia and naval reserve, members of which may become associate members, and

Civilians interested in naval subjects, the development and expansion of the naval service, who may become associate members.

Members are, therefore, earnestly urged to lend an active hand towards the expansion of the Institute:

(a) First of all in bringing the benefits of membership before those entitled to become members, and then in recommending the PROCEEDINGS to such of their friends as are interested in the navy.

(b) In giving the Institute the benefit of articles, professional notes, experiences and illustrations, and in recommending that others do so.

(c) In making use of the book department of the Institute, and in suggesting its use as well as the use of the information bureau to inquirers.

(d) In patronizing the advertisers who show their interest in the Institute and the service by helping to carry the former; in mentioning the Institute in answering advertisements; and in recommending the Institute to advertisers.

Frankness and candor can be used in appealing for support for the Institute, because it is not in any way a money-making concern or one used to further the interests of a few. The Institute is as mutual a concern as is a wardroom mess, and the Board of Control may be trusted to insure that any profits the Institute may make will go back into the business of furnishing information and professional and historical knowledge to members and subscribers at minimum cost.

The present regular membership includes about 1900 commissioned officers of the navy and marine corps; there remain in the service eligible, but not members, the following:

Line	800
Staff	600
Marine Officers	300
Commissioned Warrant Officers	550
A total of	2250

who should be members. The task which the present membership should set for itself is to secure 1000 additional regular members and 1000 associate members and subscribers during the coming year. This can easily be accomplished if each member secures one more.

Suggestions Invited

It is believed that the scope of usefulness of the PROCEEDINGS to members of the Institute can be increased and all members are invited to assist in this work. Should any topic occur to you on which you think an article could well be written, or on which you would like to read one, send such topic to the Secretary and Treasurer, together with such explanation or comment as may appear desirable in order that the intent of the suggestion may be clearly understood. The Institute is desirous of obtaining good "sea yarns" for publication. It is hoped that any one who can spin such a yarn will submit it.

Book Announcements

Announcement is made that "Steam Turbines," a Treatise covering U. S. Naval Practice, by Lieut. Commander G. J. Meyers, U. S. Navy, will be ready in December. A detailed inventory of the contents of this book appears in the Institute's Book List. This announcement is of importance in that "Steam Turbines" is the only published work covering completely the installations and practice of the U. S Navy. This book will fill a long-felt want among all marine engineers and, especially among those interested in the U. S. Navy's installations. It was written for use as a text-book at the U. S. Naval Academy, and is recommended for the same use in colleges and universities. Inspection of its table of contents will show that the treatment of the subject is remarkably complete; the number, excellence, and size of the numerous drawings and plates accompanying the text bear additional testimony to the care with which the book has been prepared and to its completeness of treatment.

The attention of divisional officers of the service is called to the value for general instructional purposes of "Physiology, First Aid, and Naval Hygiene," by Doctor R. G. Heiner, U. S. Navy. Inspection of its table of contents will reveal its possibilities towards the upbuilding of physical and moral character. It is a book that should be available for the use of every person in the naval service.

Illustrations

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Bureau of Information

The Institute offers its services as a "Bureau of Information" on professional questions and will endeavor to obtain replies from the best qualified sources. Those "Questions and Answers" which are suitable for purposes of general information, will appear in the PROCEEDINGS. It is suggested that knotty questions

which come up in professional examinations for promotion may well be submitted to this department.

Corrections In the review of "Preparedness," by Captain Henry J. Reilly, in our September-October number, the main office of the publishers, Daughaday and Company was in error mentioned as in Philadelphia instead of Chicago.

The word "not" in the third line from the bottom of page 1645, Whole Number 165, Vol. 42 should be struck out.

Membership Since September 15, 1916, 4 life, 49 regular and 41 associate members have joined the Institute.

Newly Elected Officials The roster of the Officials of the Naval Institute for the year October, 1916-October, 1917, is published in this number.

Notice Whole Nos. 145, 146, 147, 149 and 155 of the PROCEEDINGS (March, 1913, June, 1913, September, 1913, January-February, 1914, and January-February, 1915) are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 25 cents per copy.

Address of Members Members, especially those on the retired list, and civilians are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS are to be sent, and thus insure their receipt.

Book Department The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers. Bills will be rendered upon delivery of books.

Annual Dues The annual dues for 1917 become payable on January 1, 1917. It is suggested that dues be paid in lump sums covering a period of two to five years; this method of payment has advantages for members as well as for the Institute and is practiced by a number of mem-

bers, both regular and associate. Response to this notice will save the Institute a considerable sum in stationery and postage.

Non-receipt of Proceedings

Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 10th of the even numbered month.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Notice to Newsdealers

The discount to newsdealers is now 10 per cent, instead of the 25 per cent heretofore allowed on subscriptions.

ANNAPOLIS, MD., November 15, 1916.

PROFESSIONAL NOTES

Prepared by LIEUTENANT R. S. EDWARDS, U. S. NAVY

GENERAL ARRANGEMENT

VESSELS BUILDING.
CHARACTERISTICS OF NAVAL VESSELS.
ORGANIZATION OF THE NAVY.
EXERCISES AND MANEUVERS.
ACCIDENTS.
PROGRESS IN AVIATION.

Argentina 1971
Austria 1972
France 1972
Germany 1973
Great Britain 1974
Greece 1976
Holland 1977
Italy 1977
Japan 1977
Portugal 1978
Roumania 1978
Russia 1979
Spain 1979
United States 1979

UNITED STATES NAVAL MILITIA AND NAVAL RESERVE 1999
NAVIGATION AND SIGNALING 2003
ORDNANCE AND GUNNERY 2003
ENGINEERING 2010
SUBMARINES 2025
AERONAUTICS 2029
LESSONS OF THE WAR 2038
MERCHANT MARINE 2045
MISCELLANEOUS NOTES 2047
CURRENT NAVAL AND PROFESSIONAL PAPERS 2049

ARGENTINA

The Bethlehem Steel Co. has received an inquiry from the Argentine Government covering construction of ten merchant ships at a cost of approximately $25,000,000. It is understood that they are to be used as merchant vessels between Argentina and this country in times of peace, but in the event of war they can be converted into troopships. The project has been under consideration for something like two months and Argentina is about to appoint a special commission to cooperate with the officials of the Bethlehem Co.—*Shipping Illustrated*, 30/9.

AUSTRIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Ersatz Mon'ch	24,500	22½	10 14-in.	Trieste	Laid down, 1914
" Budapest	24,500	22½	same	"	" " 1914
" Wien....	24,500	22½	same	Fiume	" " 1914
" Hapsburg	24,500	22½	same	Trieste	" " 1915

VESSELS BUILDING IN JULY, 1914, AND NOW COMPLETED

1 Battleship					
Szent Istvan..	20,010	20	12 12-inch	....	Completed in 1914
5 Light Cr'sers					
Saida class....	3,454	27	9 4.1-in., 2 6-pdrs.	....	Completed in 1914–15

NOTE.—Approximately 24 torpedo boats and six submarines were building in July, 1914. Official information regarding naval matters being unobtainable since the outbreak of war, it may be assumed that ship yards have been kept busy to their utmost capacity, and that new vessels have been laid down as fast as those building have been completed.

DANUBE MOTOR GUNBOATS.—From all accounts the Austrians have in the past two years created practically an entire motor fleet the major part of which does service on the Danube. The German A. E. G. has established workshops at Budapest, where internal combustion engines are built and repairs effected. About a dozen small monitors are believed to have been completed at Budapest and Linz, all, or nearly all, of which are propelled by oil engines. They are probably very small craft of the "tinclad" variety, mounting one or two quick-firers in a turret, and having 2-inch armor plating over vital parts. The older vessels of this class were a great trouble to the Serbians, who had nothing to oppose them until the arrival of the British naval detachment with launches and torpedo gear. One monitor, the *Temes*, was then destroyed by a mine in the Danube in November, 1914, while a second one was torpedoed and sunk by a British picket boat in the following April. In addition to the monitors, a large number of vedette boats were commissioned by the Austrians during the Serbian campaign, some being specially built and others converted from pleasure launches. The original Austrian river flotilla consisted of ten boats, six of which were driven by petrol or benzine motors. The largest was 36½ tons, and could do 14 knots, but there were two of 25 tons which could travel at 25 knots. All were armed with machine guns. A number of these little craft are known to have been destroyed in the course of the war.—*Shipping Illustrated*, 23/9.

FRANCE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Languedoc....	24,828	21.5	12 13.4-in., 24 5.5-in.	La Seyne	Laid down April 28, 1913
Normandie....	24,828	21.5	same	St. Nazaire	" July 5, 1913
Flandres.....	24,828	21.5	same	Brest	" Oct. 10, 1913
Gascogne	24,828	21.5	same	Lorient	" Oct. 1, 1913
Bearn.....	24,828	21.5	same	La Seyne	Contract Jan. 7, 1914

NOTE.—There are approximately six destroyers and 23 submarines under construction. (Lack of information since outbreak of war has made it impossible to correct table to date.)

In July, 1914, France had building approximately three destroyers and 22 submarines. Since the outbreak of war it is probable that France has increased her construction program to the extent permitted by the building facilities.

GERMANY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Ersatz Worth.	29,000	....	8 15-in., 16 5.9-in.	Kiel	Laid down Sept., 1913
"T" 1913.....	29,000	....	same	"	" May, 1913
Ersatz Friedrich III.	30,000	....	8 15-in., 18 5.9-in.	....	" summer 1914
Cruisers of the Line					
Ersatz Hertha.	28,000	28.5	8 12-in.	Wilhelmshaven	Laid down July, 1913
Ersatz Victoria Louise.	.....	....	....	....	" summer 1914

NOTE.—In July, 1914, Germany had building approximately 24 destroyers and 18 submarines.

No accurate information regarding naval matters has been obtained since the outbreak of the war, but it is reported that ship construction has been pushed to the full extent of building facilities.

GERMAN SUBMARINES FROM A BRITISH VIEWPOINT.—Some curiosity has naturally been exhibited as to the engines of the newer German submarines. In the course of an article on this subject *The Shipbuilder* points out that the Germans owe the measure of success which their submarines have attained, in the main, to the successful development of the Diesel engine. At a time when many engineers in this country were inclined to sniff at this type of motor engine, the Germans, with characteristic energy, devoted themselves to its development, and before the outbreak of war it was known that they had met with the reward for which they had worked. The German naval authorities adopted the very sensible course of sending officers and men to "grow up" with the engines, thus enabling them to acquire that knowledge of material so essential to the efficient and reliable operation of light, high-speed reciprocating machinery. The great majority of Germany's submarine engines are manufactured at Augsberg and Nuremberg, and by Krupp at Kiel. The Augsberg engine was of the four-cycle, single-acting type, directly reversible by compressed air, and was built to develop 1000 b. h. p. in six cylinders at 450 r. p. m. The cylinder bore was 310 mm. and the stroke 420 mm. Just before the declaration of war the Nuremberg works had under construction or test a number of eight-cylinder, single-acting, two-cycle submarine engines, rated at 850 b. h. p. at 450 r. p. m., but powers as high as 1050 b. h. p. could be obtained when necessary. This type of engine had a cylinder bore of 310 mm., a scavenger-cylinder bore of 475 mm., and a stroke of 340 mm. The Krupp two-cycle engine, as built just prior to the declaration of war, was a six-cylinder, single-acting engine, directly reversible by compressed air, and developed about 900 b. h. p. at 450 r. p. m. At higher speeds of revolution about 950 b. h. p. was obtained. It may be that the power of the Augsberg four-cycle and the Krupp two-cycle motors has been increased by adding two more working cylinders, thus making each type capable of developing about 1350 b. h. p. In the case of the Krupp design, however, the engine would be excessively long. At any rate, the Germans have evidently made the Diesel engine a conspicuous success.—*Naval and Military Record* (British), 20/9.

GERMAN SUBMARINES CONSTRUCTED SINCE THE WAR BEGAN.—Prince von Buelow, former German Imperial Chancellor, informed a neutral newspaper man in Geneva, Switzerland, recently that since the beginning of the war Germany has built 225 submarines. The German naval authorities,

the Prince is reported to have added, are paying more attention to submarines than to battleships, and Austria-Hungary is doing likewise.—*Army and Navy Journal*, 28/10.

GERMAN ARMY AEROPLANES.—From German army flying machines captured by the French up to March of the present year a writer in the French technical journal *L'Aérophile* has been able to describe the types used by the Germans and to show the tendencies of their designers. He points out that German aeroplanes have since the war began tended more and more towards uniformity.

The giant machines so often referred to in newspaper despatches from Europe are seldom seen along the western front. In addition to the Taube, that was the characteristic German aeroplane at the outbreak of the war, there are now in use the types called Aviatik, Albatross and the Fokker, all of which are said to be little more than copies of French machines either as a whole or in part. The tractor is the present typical German aeroplane type. There is a tendency to decrease the length of the fuselage, and it is considered worthy of note that the Germans have been able to use such short bodies with success. The decrease in length may be shown through the fact that the average length of the machines was 30 feet in 1914 and it is 26 feet now. Ailerons are used on all types and are sometimes of very peculiar design.

The inter-plane bracing has been much reduced in recent models. On most of the machines in use at present there are eight metallic struts, connected by a simple rectangular system of wiring, in place of the complicated cantilever truss for which German construction used to be noted. The connection from the fuselage to the upper wing is made through a pair of supports in the shape of an inverted V. These offer no more resistance than the old system of four short vertical struts, and are much stronger. The wings are now covered with a yellowish cloth, and doped with a transparent varnish of a bluish tint, which makes the wing more difficult to pick out against a blue sky.

Before the war the landing gear favored by the Germans was that of the Etrich Taube, a form not unlike Bleriot's. This has been abandoned in favor of the simple V chassis constructed largely of metal. Rubber shock absorbers are used, and the track is large (from six to eight feet). All the German biplanes use 6-cylinder fixed motors, mounted with the cylinder heads protruding up out of the fuselage.

All the machines the writer discusses have two seats in tandem, but there is no agreement as to whether the passenger should sit in front of or behind the pilot. The controls are of the usual type, with wheel and foot-bar. Dual control is not employed, German military experience apparently showing this to be an unnecessary complication.—*Army and Navy Journal*, 28/10.

GREAT BRITAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
1 Ship.....	27,500	25	8 15-inch	.....	To be completed in 1917
Renown.....	25,750	22	same	.....	" " "
Repulse.....	25,750	22	same	.....	" " "
Resistance....	25,750	22	same	.....	" " "

NOTE.—Approximately 31 destroyers and 21 submarines were building in July, 1914. Since the war no official information regarding naval matters has been available, but it has been reported that the number of vessels building has been increased to the full capacity of the ship yards and that new vessels have been laid down as fast as those building have been completed.

40,000-TON BATTLESHIP RUMORED.—*Sea Power*, the organ of the Navy League of the United States, will make the statement editorially that "it is hardly to be doubted that Great Britain is preparing a surprise for the world in the way of a battleship bigger and better than any existing type."

This opinion is based on information received from abroad. The Navy Department, according to *Sea Power*, is said to have received rumors that Great Britain is building one or more battleships of 40,000 tons displacement.

"It is reported," says *Sea Power*, "that Great Britain is installing 18-inch guns on her latest type of battleship. We are informed also that a reliable observer, recently returned from England, saw under construction there a battleship (or battle cruiser?) larger than anything building or contemplated elsewhere, so far as he knew, but it was fenced in and he could learn very little about it.

"The Navy Department, it is said, has received rumors that Great Britain is building one or more battleships of 40,000 tons' displacement. It is believed that, if this be true, these vessels will probably carry batteries of ten 18-inch guns."—*N. Y. Times.*

EIGHTEEN-INCH NAVAL GUNS FOR USE ON LAND.—The British are building a naval gun of 18-inch caliber, weighing from 150 to 160 tons, firing a high explosive projectile that weighs 2950 pounds, and with an armor piercing power which exceeds anything heretofore known in ordnance. It is the biggest and most destructive weapon of warfare yet devised.

In naval circles here, where the report about the 18-inch gun has just been received, the opinion is expressed that it is intended for operations against land fortifications. In view of the achievements of big guns at Liege, Namur and Antwerp, it is believed that the new monster gun is being prepared for the great advance.

Such a gun, it is said, is too big to be of practical value in naval warfare. It would require an increase in the tonnage of the *Pennsylvania*, a 32,000-ton vessel, to mount six of these giant guns. The *Pennsylvania* carries twelve 14-inch guns, which have an armor piercing range of about 16,000 yards. And, in the opinion of ordnance experts of the Navy Department, the reduction in the number of guns from twelve to six, which the mounting of the 18-inch type would necessitate would force a reduction in volume of fire and in the destructive area of fire that the greater armor piercing range and the higher destructive powers of the 18-inch projectile would not countervail.

But the reports regarding the 18-inch gun are of such character that credence is given to them by naval officers and the belief is that the British propose to spring some new sensation in an attack upon land fortifications. In that case, it is said, these guns would be mounted on moving fortresses, probably with a specially constructed turret of greater height which would permit a higher angle, of fire and consequently a greater range.—*New York Herald.*

BRITISH SUBMARINES FOR CHILE.—The British Government, it is announced, will turn over to Chile five American-built submarines as compensation, because of the delay in the delivery of dreadnoughts, which were contracted for in England by Chile.

The battleships *Almirante Latorre* and *Almirante Cochrane*, which were laid down prior to 1911 in British yards for Chile, were taken over by the British Government in the early part of the war. A number of submarines, which had been constructed in the United States for Great Britain, were refused delivery by the American Government until after the war. These submarines have been guarded by American naval officers so that the possibility of their removal from this country to the possession of a belligerent during the war might be eliminated.—*N. Y. Times.*

THE INVESTIGATION OF THE ROYAL AEROPLANE FACTORY.—One notes with surprise—almost with dismay—the engineering inefficiency disclosed by the investigation into the Royal Aeroplane Factory at Farnborough. When the shortage of aeroplanes, especially those with high-powered engines, evoked outcries after each German air raid we were led to believe that requirements at the front explained the deficiency at home, but a more humiliating explanation is contained in the report. The engineering department has been badly organized, badly financed, and badly managed. We shall not attempt to decide which was the more blameworthy of the two—the government which underpaid the department, or the men of engineering ability who preferred the better cash they could obtain elsewhere, and so deprived the factory of really useful assistance. The engineers can defend themselves by saying that if they preferred better pay elsewhere the country lost nothing because all engineering work now is helping us directly or indirectly, and in the case of the Royal Aeroplane Factory the planes and engines have never equalled those produced in private manufactories. If the Royal Aeroplane Factory is mainly an experimental establishment, as its defenders allege, it is strange that only 22 per cent of its work is of an experimental character. Even with 35 per cent which the Air Board desires to add to this figure experimental work is only 57 per cent of the total. Practically half the work has been manufacturing, yet the engineering department admittedly has not been run on engineering lines. There are other deficiencies of management, all of which one reads with genuine regret. To eke out the shortage "some" high-powered engines are being purchased from the trade, but evidently far more are necessary in order to ensure the necessary aggressive and protective margin. The remedy advocated in the report is the obvious one of greater manufacturing and more extensive buying. Even the meanest intelligence could have discovered that at the beginning of the war.—*Page's Engineering Weekly*, 8/9.

GREECE

EFFECTIVE VESSELS IN THE GREEK NAVY

Name	Displacement	Speed	Main battery	Remarks
Battleships				
Hydra	4,808	17	3 10.6-in., 5 5.9-in.	
Kilkis (ex Mississippi)	13,000	17	4 12-in., 8 8-in.	Purchased from United States
Lemnos (ex Idaho)	13,000	17	4 12-in., 8 8-in.	Purchased from United States
Psara	4,808	17	3 10.6-in., 5 5.9-in.	
Spetsai	4,808	17	3 10.6-in., 5 5.9-in.	
Armored Cruisers				
Giorgios Averoff	9,956	24	4 9.2-in., 8 7.5-in,	
Cruisers				
Conduriotis	5,500	25.5	8 6-in.	
Lambros Katsonis	5,500	25.5	8 6-in.	
Helli (ex Fei-Hung)	2,600	22.5	2 6-in., 4 4-in.	Built in Camden, N. J., U. S. A.

NOTE.—Greece also has one torpedo depot ship, three mine layers, three old gunboats, 12 destroyers and one submarine. Two more submarines building.

HOW THE GREEK NAVY WAS BUILT UP.—In surrendering her navy to the Allies, Greece yields up her dearest treasure. It was built, not like other European navies, after quarrels in legislative chambers, but by the free, eager offerings of an enthusiastic people. In 1866, some forty

years after Greece had gained her independence, patriotic Greeks all over the world, including many in Great Britain, formed the Society for the Promotion of a National Fleet. With their first round sum they bought the *Admiral Miaoulis*, still in existence as a depot ship, says the *London Standard*. Then the government itself took a hand, by means of its treasury, in developing the national fleet. That was 16 years ago. All sorts of revenues were tapped—even the pennies of the school children rolling up in a steady stream. State lotteries of 1,000,000 tickets at half a crown, with 2,000 winning numbers and a first prize of £4000, were issued every year; so that by one device and another Greece was able to launch a fleet of 40 vessels, stout enough to overawe the Turks. When one considers the poverty of Greece, this achievement in so few years is worthy of the nation to which Mr. Asquith has just paid so high a tribute.—*Army and Navy Journal*, 3/11.

HOLLAND

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Cruisers					
.....	6000	30	10 6-in.	Amsterdam	
.....	6000	30	10 6-in.	Flushing	

NOTE.—Four submarines are building, three at Rotterdam and one at Flushing, of 836 tons displacement and a surface speed of 17½ knots. The two cruisers were to be built in Holland by Krupp, and it is not known whether or not construction is proceeding.

The budget for 1917 provides for the construction of three more submarines and a mine layer.

ITALY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Carraciolo	30,000	25	8 15-in., 16 6-in.	....	To be completed in 1917
Marcantonio-Colonna.....	30,000	25	same	....	" " "
Cristofaro-Colombo	30,000	25	same	....	" " "
Francesco-Marosini.....	30,000	25	same	....	" " "

NOTE.—In July, 1914, approximately 15 destroyers, two torpedo boats, and eight submarines were building.

It is probable that the building program has been accelerated and increased since the outbreak of the war.

JAPAN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Ise	30,800	22.5	.....	Kawasaki	
Huga.....	30,800	22.5	.....	Mitsubishi	
Nagato.....	32,000	24.0	12 15-in. (?)	Kure Arsenal	

NOTE.—On April 1, 1916, Japan had nine destroyers under construction.

THE "NAGATO."—Specifications for the construction of what will be the largest battleship in Japan have just been placed with the Kure Arsenal by the Navy Department at Tokio. The battleship, which is to be named *Nagato,* will have a displacement of 32,000 tons and a speed of 24 knots, and will be equipped with twelve 15-inch guns. In comparison with the *Fuso,* the present largest Japanese battleship, the *Nagato* is of 1400 tons more displacement, and is the faster by two knots. The most noticeable developments in connection with the new battleship are the adoption of 15-inch guns and the installing of improved equipment for defence against torpedoes.—*Shipping Illustrated,* 7/10.

NEW JAPANESE SHIPYARD.—The construction of a shipyard at Tsurumi, on Tokio Bay, north of Yokohama, is being undertaken for the president of an important Japanese steamship company, and the preliminary work of reclamation, etc., is making steady progress. The area of the yard is to be about 140,000 tsubo (about 115 acres), and it is anticipated that the actual building of it will be started in December next. Four slips will be laid down for the construction of ships of 10,000 tons. It is stated that the machinery will be purchased in Japan, but steel material for shipbuilding will be obtained from the United States and the United Kingdom.—*Shipping Illustrated,* 11/11.

PORTUGAL

EFFECTIVE VESSELS IN PORTUGAL'S NAVY

Name	Displacement	Speed	Armament	Complement	Remarks
Battleships					
Vasco Da Gama	3,000	15	2 8-inch, 4 4.7-inch	220	Completed in 1877; refitted in 1903
Cruisers					
Republica.....	1,640	17.5	4 5.9-in., 2 3.9-in.	273	Completed in 1901
Sao Gabriel...	1,772	17	2 5.9-in., 4 4.7-in.	242	" " 1899
Alnurarite Reis	4,100	22	4 5.9-in., 8 4.7-in.	473	" " "
Adamaster....	1,962	18	2 5.9-in., 4 4.7-in.	232	" " 1897

NOTE.—In addition to the above Portugal has five gunboats, six destroyers, three torpedo-boats, and one submarine. (Two gunboats, two destroyers, and three submarines are in process of construction.)

ROUMANIA

THE ROUMANIAN NAVY.—According to the text-books, Roumania has an efficient and comparatively new division of monitors. It consists of four vessels of 669 tons, with a speed of 14 knots built—of all places—at Trieste, the chief shipbuilding center of the power with whom she has declared war. Each of these monitors is armed with three 4.7-inch guns, mounted singly in turrets, and two 4.7-inch howitzers, in addition to six smaller guns; and the crew numbers eighty officers and men. There is also a division of eight small torpedo boats, constructed by the Thames Ironworks Company in 1906. Some of the first fighting has naturally occurred on the Danube. The Austrian monitor *Alnos,* which a Vienna official *communiqué* announces has shelled *Turnu-Severin,* is probably a new boat, as she does not appear in any of the recognized lists.—*Army and Navy Gazette,* 2/9.

RUSSIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battle Cruisers					
Ismail	32,200	25	12 14-in., 21 5.1-in.	Galerni	To be completed in 1916 [1]
Kinburn	32,200	25	same	Baltic Works	" " "
Borodino	32,200	25	same	Galerni	" " "
Navarin	32,200	25	same	Baltic Works	" " "

[1] Three completed.

NOTE.—Approximately 44 destroyers and 19 submarines were building in July, 1914. Official information regarding naval matters being unobtainable since the outbreak of war, it may be assumed that the ship yards have been kept busy to their utmost capacity and new vessels have been laid as fast as those building have been completed.

RUSSIA MAY DIG BIG CANAL.—American engineers have drawn up details of a plan to dig a canal from the Arctic Ocean through Russia and Finland to the Gulf of Bothnia, according to a Stockholm dispatch to the *Morning Post*. The dispatch says that the project is strongly supported in Russia. The proposed canal would run from Kandalaska on the White Sea to Tornea near the Swedish frontier, and would cost 300,000,000 roubles. The total distance would be about 250 miles.—*New York Times*, 8/10.

SPAIN

VESSELS BUILDING.—There are building or projected three 15,000-ton battleships, four 5600-ton cruisers, six destroyers, and 28 submarines.

AMERICAN-BUILT SUBMARINE READY FOR ACCEPTANCE.—The Spanish submarine *Isaac Peral*, has fulfilled every contract requirement, according to word received by her builders, the Fore River Shipbuilding Corporation. Off Provincetown the submarine went under water to a depth below the stipulated 150 feet, it was stated. Speed on the surface was said to exceed 15 knots, and more than 10½ knots submerged.

With her trials completed the *Isaac Peral* is now going through a training period to allow her Spanish crew to become thoroughly accustomed to the vessel. It is expected she will be ready for acceptance about November 15.—*N. Y. Times*, 29/10.

UNITED STATES

GERMAN OPINION OF THE BUILDING PROGRAM.—Reviewing the new American naval program, Captain Persius, the German naval writer, expresses the opinion that it can hardly satisfy Americans who believe that the uncertainty of the Panama Canal necessitates the maintenance of two fleets, one for the Pacific and a second for the Atlantic Ocean. "Captain Persius," says a Berlin despatch to the *New York Times*, "recognizes the enormous responsibility of naval security in forming a new program while various types of naval arms are still on trial, and only very meager details as to their performances, especially at the Skagerrak battle, can reassure him, but on the whole he thinks the money granted for them wisely apportioned. He thinks the American naval authorities deserve no little credit for having provided for a comparatively large number of submarines, despite British attempts to minimize this weapon's importance. He also approves of the American Admiralty's disinclination to approve the widely held view that dreadnought cruisers failed to make good at the Skagerrak. 'In Germany,' he says, 'the American fleet's development will always be followed with great interest, but not because it is expected that our

UNITED STATES VESSELS BUILDING AND AUTHORIZED

Name	Displacement	Speed	Main battery	Where building	% completed	Remarks
Battleships						
Arizona	31,400	21	12 14-in.	New York	100	Commissioned 17-10-16
New Mexico	32,000	21	12 14-in.	New York	52	
Mississippi	32,000	21	12 14-in.	Newport News	60	
Idaho	32,000	21	12 14-in.	Camden	66	
Tennessee	32,300	21	12 14-in.	New York	1	
California	32,300	21	12 14-in.	Mare Island	5	
Maryland, Washington, Colorado, West Virginia	32,600	21	8 16-in.	Contracts not let	....	To be begun as soon as practicable.
No. 49, 50, 51, 52, 53, 54	Characteristics not determined				....	To be begun by July 1, 1919.
Battle Cruisers						
No. 1, 2, 3, 4	35,000	35	10 14-in.	Contracts not let	....	To be begun as soon as practicable.
5, 6	Characteristics not determined				....	To be begun by July 1, 1919.
Scout Cruisers						
No. 4, 5, 6, 7	7,100	35	8 6-in.	Contracts not let	....	Each carries 4 aeroplanes.
8, 9, 10, 11, 12, 13	Characteristics not determined				....	To be begun by July 1, 1919.
Destroyers						
Davis	1,071	30	4 4-in.	Bath	100	Delivered 4-10-16.
Allen	1,071	30		Bath	91	
Wilkes	1,110	29.5		Cramp's	95	
Shaw	1,110	29.5		Mare Island	85	
Caldwell	1,085	32		Mare Island	28	4 triple tubes.
Craven	1,085	32		Norfolk	9	
Gwin	1,123	30		Seattle	10	
Conner	1,121	30		Cramp's	16	
Stockton	1,121	30		Cramp's	16	
Manley	1,085	32		Bath	35	
20 (Nos. 75–94)	1,185	35	4 4-in.	Not ordered	....	4 triple tubes. To be begun as soon as practicable.
30 (Nos. 95–124)	Characteristics not determined				....	To be begun by July 1, 1919.
Gunboats						
No. 21	1,575	12	3 4-in.	Charleston	....	
No. 22	Characteristics not determined				....	To be begun by July 1, 1919.

Submarines.

Building 31.

Authorized to be begun at once:— 3 800-ton coast defence submarines.
27 smaller coast defence submarines.

Authorized to be begun by July 1, 1919:—28 coast defence submarines.
9 fleet submarines.

Vessels of the train.

Building and authorized:—

4 fuel ships,
1 supply ship,
2 ammunition ships,
1 hospital ship,
1 repair ship,
2 transports,
2 destroyer tenders,
1 fleet submarine tender.

NOTE.—The fuel ship *Maumee* was commissioned October 23.

respective fleets in more or less distant time would be compelled to measure their strength, knowing too well that America's peril is west of her shores, in Japan. At the same time we live under no illusions as to America's close relations with Great Britain.'"—*Army and Navy Journal,* 16/9.

CHARACTERISTICS OF NEW VESSELS

BATTLE CRUISERS.—The U. S. Navy Department announced on October 5 that the plans had been completed for the four battle cruisers authorized at the last session of Congress and bids are invited for the construction of the battle cruisers, exclusive of armor and armament. The bids will be opened on December 6. Circulars for the information of bidders are ready for distribution. The plans call for vessels 850 feet in length, with a displacement of 35,000 tons, and having a speed of from 32 to 35 knots. It is understood now that the beam of the battle cruisers is to be about 97 feet. The great length was found to be necessary to provide displacement for the tremendous amount of machinery which will be necessary for the propulsion of the vessels at high speed and to carry the belt of armor of about eight inches in thickness. The battle cruisers, it is understood, will each have seven funnels. The vessels, which will be equipped with ten 14-inch guns each, will cost $20,500,000 each, of which $4,000,000 will be for the armor and armament and the balance for the hull and machinery and equipment.—*Army and Navy Journal.*

NAVAL HOSPITAL SHIP.—The new naval hospital ship is to be furnished with several stabilizers so that she will roll as little as possible. She is to be 460 feet long by 60 feet wide, with a capacity of 300 patients in peace time and 500 in war time. In addition to this, there are several special consulting rooms, where out-patients or day patients may come and receive treatment. One of these is in connection with the eye, ear and throat equipment, which is to be as complete as any to be found in a city hospital. A sound-proof room for testing the hearing is given in the plans, as well as a dark room for testing the eyesight. An X-ray room will be included, with a similar room for the development of the photographic plates.

The wards are divided up into special classes for the treatment of special diseases, two large sized wards being isolated for contagious cases. The isolation wards communicate with the rest of the ship by only one door, which may be heavily guarded, and by chutes through which the laundry and bed linen may be shot down to the sterilizing apparatus below.

A diet kitchen, with all the latest cooking equipment, is provided for, and Surgeon R. C. Holcombe, U. S. Navy, has invented a new and clever arrangement by which every patient may receive his food while hot. It is in the nature of a steam table on wheels, which is filled with hot food in the kitchen on the lower deck, rolled down the hall and into an elevator, and brought out on the next deck, where it is wheeled into the ward and down the aisle of beds, the plate of each patient being supplied from its steaming vats.

Connected with each ward are several special small rooms. There is a quiet room where very serious cases are taken; a special room for kidney and bladder cases, where everything must be elaborately sterile; a special hydrotherapeutic room and a thermo-therapeutic room. Besides this, there are numerous other small rooms for special surgical cases, when an operation is a life-and-death matter.

The ship will also contain a biological laboratory, a dental laboratory, and an animal yard where animals will be kept for testing out certain theories of germ infection. In an obscure corner of the ship there is to be a morgue connected with the refrigerating plant, where the bodies of dead officers and sailors may be preserved and brought back to their families at home instead of being buried over the side of the ship as was the former custom.—*Army and Navy Register.*

BRITISH OPINION OF U. S. BATTLE CRUISERS.—The design of the new American battle cruisers is likely to exercise considerable influence on naval construction throughout the world. There are no converts like new converts. But it is not a little surprising that the American naval authorities, once they were convinced of the value of capital ships of the highest possible speed, should have decided on so revolutionary a step in construction as the new battle cruiser plans indicate. The average speed of the ships of the American fleet, class by class, is considerably lower than that of any other fleet. It is true that twelve years ago three scouts were authorized by Congress, which obtained on trial speeds ranging from just over 24 to 26½ knots. In the intervening years, however, no effort has been made to strengthen the navy by any swift vessels larger than torpedo boat destroyers. The battleship speed, which was about 18 knots in the early years of the century, is in the latest types only 20 or 21 knots. No battle cruisers or scouts have been built. It looked at one time as though the naval authorities as represented by the Navy Department intended to construct in future no swift ships except destroyers, and in respect to these craft there has been practically no progress during the past ten years. In 1906 Congress gave authority for the building of three destroyers of 700 tons displacement, only one of which attained a speed exceeding 29 knots. These vessels were armed with five 3-inch guns and three twin 18-inch torpedo tubes. The latest type of destroyer to be put in hand displaces 1150 tons and mounts four 4-inch quick-firers in association with four twin 21-inch torpedo tubes. In spite of the increase in displacement the speed, it is anticipated, will not exceed about 30 knots. In other words, while there has been a marked development of speed in other navies of the world, the Americans have stood outside the movement.

The war has worked a conversion on the other side of the Atlantic. The new battle cruisers are to attain a speed of 35 knots, and the destroyers are to be as swift. The bureau of steam engineering has suddenly been called upon to advance in one stage beyond the point which other navies—so far as published information goes—have reached by a gradual progress. It speaks well for the technical advisers of the Navy Department that they regard the outlook without dismay, although they are now required to produce marine engines of about eight times the power of those recently installed in the battleship *Pennsylvania*. Consultations have been held with the bureau of construction and it has been decided to be essential to have a hull with fine lines and a length approximating to that of the most recent trans-Atlantic liners. With a courage characteristic of American naval officers it has been determined to adopt in these long and speedy ships the electric drive and to use oil fuel instead of coal. In explanation of the latter decision Engineer-in-Chief Robert S. Griffin has explained that "the coal required to drive one of these cruisers at full speed for a day would drive a battleship across the Atlantic and back. If full speed can be maintained steadily for three days and seven hours it will take one from New York to Liverpool, but as that would require 12,000 tons of coal it is certain such a run will never be attempted on coal fuel." The chief of the bureau of steam engineering has explained that 100 tons of oil can give the same power as can be obtained from about 150 tons of coal, apart from the many advantages associated with liquid fuel. American opinion, in short, now confirms the decision taken by the British naval authorities many years ago when it was decided to adopt oil in place of coal. It has been calculated that with oil fuel and turbines operating on electric generators the speed of the new American cruisers will jump from 15 knots to the maximum in a few minutes—no mean military advantage.

When these battle cruisers are completed the American fleet will obtain a group of six large armored ships with a speed 60 to 70 per cent greater than the mean speed of the latest battleship squadron. The newest scouts

are to possess a similar rate of steaming and the 50 destroyers included in the new program will at any rate not be slower than the battle cruisers and scouts. In other words, in the light of the lessons which this war has conveyed, the American naval authorities have determined on a new departure of policy, which will probably have far-reaching results. Once the fleet has been provided with six battle cruisers, ten scouts and 50 destroyers with a speed of about 35 knots it is probable that steps will be taken considerably to increase the speed of the latter battleships to be put in hand. It may be assumed that the new chief of naval operations will devote himself to the study of strategical and tactical problems with a view to reaching definite conclusions as to the value of speed, and that his views will react on the Navy Department and Congress. As soon as he turns to the new naval program he will be struck by the possibilities which the accession of so many swift ships will open up. He will find himself confronted with naval conditions of some embarrassment. On the one hand will be the existing navy with only three ships with a sea speed exceeding 21 knots, while on the other there will be three important groups of ships, embracing 66 units, with speeds of 35 knots or more. Whatever may be the engine power installed in the ten battleships which have just been authorized, it may be anticipated that the effect of the construction of battle cruisers, scout cruisers and destroyers of such high speed will tend to push back into early obsolescence no small proportion of the ships in the existing fleet. That is the inevitable tendency of such a revolutionary movement as the American authorities have now decided upon. The price will be a heavy one. The appropriation act just passed carries a sum of £63,000,000, and everything suggests that this figure marks not the limit of naval expenditure in the United States, but a starting point.—*Naval and Military Record* (London).

BIDS FOR NEW VESSELS

BATTLESHIPS.—The Newport News Shipbuilding and Dry Dock Company proved the lowest bidder on battleships. Its bid for one electric driven battleship was $10,470,000, to be completed within 39 months, and for two battleships of that type, $10,375,000 each, the first to be completed within 39 months and the second within 45 months.

A conditional bid was submitted by the Fore River Shipbuilding Company at a lower figure which, however, provided for the contract price to be increased or decreased in accordance with any rise or fall in the cost of labor and materials. The Fore River Company proposed that the Federal Trade Commission should settle any conflicting claims between the Navy Department and the company which might arise over computations in cost of labor or materials.

The Cramp Shipbuilding Company, of Philadelphia, submitted a letter stating that abnormal conditions in the labor and steel markets made it impossible for it to bid on a battleship at a specified price or for delivery at a specified time. That company offered to build a battleship to be completed as soon as possible, the government to pay all costs and overhead charges and ten per cent commission. That offer is to remain open 45 days.

The New York Shipbuilding Company bid $11,250,000 on one battleship, steam driven, in 46 months, and $11,350,000 on one for completion within 40 months.

In general, the price bid for battleships this year is about $2,000,000 to $3,000,000 higher than a year ago.

The bid submitted by the Fore River Company, in accordance with the terms of the Newport News bid, was for $10,875,000 for an electric driven battleship and $11,475,000 for the steam driven type.—*N. Y. Herald.*

800-TON SUBMARINES.—The following bids were received by the Secretary of the Navy, November 1, for constructing 800-ton submarine boats

Nos. 105 and *106*, authorized by act of August 29, 1916, limit of cost $1,200,000 each.

Bid A, in accordance with department's specification and bidder's design; B, in accordance with department's specifications modified and bidder's design.

The Lake Torpedo Boat Co., Bridgeport, Conn., one vessel, surface speed, 16 knots; submerged speed, 11 knots; design 30-A, $1,195,000. Time 24 months, in combination with design 24-1 and 27 months in combination with submarines 31-A or 31-B. This bid is contingent on the company's receiving the contract for the coast type submarines bid on. They will license the Secretary of the Navy to build a submarine of their design, furnish plans and specifications, etc., at $100 per ton net design, submerged displacement.

Electric Boat Co., New York City, proposal No 1, one vessel, 852 tons surface displacement to be constructed at the works of the Fore River Shipbuilding Co., Quincy, Mass., in 26 months. Design 73-AA, Navy Department's form of contract B, $1,168,000 or will construct two vessels, one in 26 months and one in 27 months at $1,148,000 each. Proposal No. 2, one vessel, design 73-A, Navy Department's form of contract C, to be constructed within 26 months, $1,189,000. Two vessels, one to be constructed within 26 months and one within 27 months at $1,167,000 each.—*Army and Navy Register.*

DESTROYERS.—*Class 1.*—Department's design.

Class 2.—Hull and equipment department's design; machinery, bidder's design.

Bath Iron Works, Bath, Maine. Class 2, 1154 tons trial displacement: Two vessels, 35 knots, 22 and 23 months, $1,185,000 each; three vessels, 35 knots, 22, 23 and 24 months, $1,160,000 each. Guarantees of fuel-oil consumption at maximum speed instead of horsepower. Four vessels, 35 knots, 22, 23, 24 and 25 months, $1,150,000 each. Modified form of contract required.

Union Iron Works, San Francisco, Cal. Class 1, to be built at San Francisco or Alameda, Cal.: Two vessels, 27,000 shaft horse-power, 22 and 23 months, $1,195,000 each. Four vessels, 22, 23, 24 and 25 months, $1,190,000 each. Six vessels, 22, 23, 24 and 25 months, $1,190,000 each; and two others within 26 months, $1,185,000 each. These vessels to be duplicates of those covered by Fore River Shipbuilding Corporation proposals with conditions and data submitted by latter company attaching to these bids. Modified form of contract required.

Fore River Shipbuilding Corporation, Quincy, Mass. Class 1, 27,000 shaft horse-power: Four vessels, one in 24 and others in 27 months, $1,175,000 each. Six vessels, one in 24 and others in 28½ months, $1,165,000 each. Eight vessels, one in 24 and others in 30 months, $1,160,000 each. Modified form of contract required.

Seattle Construction and Dry Dock Company, Seattle, Wash. Class 1, 27,000 shaft horse-power: One vessel, 22 months, $1,386,000. Two vessels, 22 and 24 months, $1,370,000 each. Modified form of contract required.

William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa. Class 1, 27,000 shaft horse-power: Two vessels, 27 and 28 months, $1,195,000 each. Four vessels, 27, 28, 29 and 30 months, $1,195,000 each.—*Army and Navy Journal.*

COAST DEFENCE SUBMARINES.—*Class 1.*—In accordance with department's specifications and bidder's design. No bids were received under this class.

Class 2.—In accordance with department's specifications modified and bidder's design.

The Electric Boat Co., New York City, proposal No. 1, submarines of 570 tons displacement, design 77-A, 24 or more to be constructed at the

works of the Fore River Shipbuilding Co., Quincy, Mass., the Union Iron Works, San Francisco or Alameda, Cal., one vessel within 18 months and two each month thereafter for 22 months and three each month thereafter, 10 to be delivered on the Pacific coast, remainder on the Atlantic coast, $835,400 each; proposal No. 2, department's form of contract A, vessels of 570 tons, design 77-AA, 24 or more vessels constructed at places mentioned above, one in 18 months, two each month thereafter for 22 months and three each month thereafter, 10 on the Pacific coast, remainder on the Atlantic coast, $823,400; proposal No. 3, contract A, vessels of 530 tons, design 68-C, 24 or more, one in 15 months, two each month thereafter for 25 months, and three each month thereafter, $812,400 each; proposal No. 4, vessels of 530 tons displacement, design 68-CA, 24 or more, one in 15 months, two each month thereafter for 25 months, and three each month thereafter, $803,400 each; proposal No. 5, vessels of 570 tons displacement, design 77-A, department's form of contract B, 24 vessels, one in 25 months and two each month thereafter, $697,000 each; proposal No. 6, vessels of 570 tons displacement, design 77-AA, contract B, 24 or more, one in 25 months and two each month thereafter, $685,000 each; proposal No. 7, vessels of 530 tons displacement, design 68-C, form of contract B, 24 or more, one to be constructed in 22 months and two each month thereafter, $677,000 each; proposal No. 8, vessels of 530 tons displacement, design 68-A, form of contract B, 24 or more, one in 22 months and two each month thereafter, $668,000 each. This firm will license the Secretary of the Navy to construct three submarines of any of the above designs and will furnish plans and specifications in duplicate for the sum of $50,000, excluding engines, and $62,500 each, including engines.

California Shipbuilding Co., Long Beach, Cal., proposal No. 1, vessels of 495 tons surface displacement, not less than five or more than six submarines, surface speed, 14 knots, submerged speed, 11 knots, of the Lake design. Design No. 31-A, $698,000 each; design No. 31-B, $696,000 each. Will deliver the first vessel within 23 months and successive vessels at intervals of three weeks. This bid is contingent upon the award to the Lake Torpedo Boat Co., of submarines bid on by that firm. Proposal No. 2, vessels of 485 tons surface displacement, not less than five or more than six, speed as above, Lake design 24-M1, $693,000 each. Will deliver the first vessel within 22 months and successive vessels at intervals of three weeks.

Lake Torpedo Boat Co., Bridgeport, Conn., proposal No. 1, not less than six or more than 10 vessels, 495 tons surface displacement, surface speed 14 knots, submerged speed, 11 knots, type 31-A, $694,000 each; type 31-B, $692,000 each. Will deliver first vessel within 22 months, and successive vessels at intervals of three weeks. This company will license the Secretary of the Navy to build a submarine of L-8 type and will furnish plans and specifications, except engine plans, for $100 per ton, net design of submerged displacement, not less than six or more than 10, speed as above, design 24-M1, $689,000 each. Will deliver first vessel within 21 months and successive vessels at intervals of three weeks. Will license the Secretary of the Navy to build a vessel under conditions of proposal No. 1.

Schneider & Cie, Paris, France. This firm will license the Secretary of the Navy to construct one or more submarines and will furnish plans and specifications, etc., of type F, project A, plan No. 766, for $68,000 for the first vessel and $38,000 for each successive vessel. One or more submarines, type F, project B, plan 767, for $57,000 for the first vessel and $33,000 for each successive vessel. One or more submarines, type F, project C, plan 768, for $70,000 for the first vessel and $40,000 for each successive vessel. A letter was received from this firm showing the length of the time required to construct vessels of the above types in France and the cost of such vessels prior to the outbreak of the war, and

it is the opinion of the company that submarines of the above types could be constructed well within the limit of the amount appropriated by Congress, viz., $700,000 each. The bid was accompanied by a letter from the French Consulate General at New York, giving data as to the standing and facilities of this firm.—*Army and Navy Register.*

SCOUT CRUISERS.—*Class 1.*—In accordance with department's plans and specifications, including hull and turbine propelling machinery.

Seattle Construction & Dry Dock Co., Seattle, Wash., one vessel to be constructed in 30 months, $4,975,00. This proposal is based on working eight hours per day and is contingent upon receiving the necessary material within reasonable time.

The Fore River Shipbuilding Corporation, Quincy, Mass., proposal A, two vessels, one to be constructed in 33 months and one in 36 months, 7100 tons trial displacement, $4,900,000 each. This proposal is based on material and labor remaining as at present. If the price of labor and material is increased this increase will be paid by the government, and if the price of labor and material is decreased the government is to have the benefit of such decrease. Delivery to be made at Quincy after dock trial of machinery. Sea trials are to be at the department's risk and expense. Proposal B, on account of unusual industrial conditions this firm will construct a vessel at the cost of material and labor and overhead expenses plus a commission of 15 per cent to be paid as follows: Cost of material and labor plus 10 per cent monthly, 3 per cent upon the completion of the vessel and 2 per cent after delivery. Proposals A and B, if one or more of the battleships, bids for which were recently opened, or one or more battle cruisers, bids for which are to be opened December 6, are awarded to this firm, they will be unable to construct any of the scout cruisers.

Class 2.—In accordance with department's plans and specifications and machinery of bidder's design. No bids were received under this class.

The Union Iron Works Co., San Francisco, Cal., submitted a letter offering to build two scout cruisers at the actual cost of material and labor plus a commission of 15 per cent, the amount to be determined by the Federal Trade Commission.

The New York Shipbuilding Co., Camden, N. J., in a letter to the department stated that they had contemplated bidding on scout cruisers of alternative design, but found it impossible to bring their figures within the amount appropriated for these vessels.—*Army and Navy Register.*

ARMOR FOR NAVAL VESSELS.—The following bids were received by the chief of the bureau of ordnance, U. S. Navy, Washington, D. C., November 1, for furnishing 45,583 tons more or less armor for naval vessels:

Bethlehem Steel Co., South Bethlehem, Pa., armor for two battleships, class A, $420 per ton, not to exceed 14,479.2 tons; class A-2 turret armor, $485 per ton, not to exceed 820 tons; class B, armor, $466 per ton, not to exceed 602 tons; class C-1, armor, $395 per ton, not to exceed 116 tons; class C-2, armor, $785 per ton, not to exceed 4 tons. Armor for two battle cruisers; class A-1, $435 per ton, not to exceed 6086 tons; class A-2, turret armor, $485 per ton, not to exceed 336 tons; class B, $266 per ton, not to exceed 288 tons; class C-1, $395 per ton, not to exceed 57.4 tons; class C-2, armor, $785 per ton, not to exceed 2.6 tons.

Midvale Steel Co., Philadelphia, Pa., armor for one battleship, class A-1, armor, $427 per ton, not to exceed 7500 tons; class A-2, turret armor, $496 per ton, not to exceed 450 tons; class B, armor, $466 per ton, not to exceed 325 tons; class C-1, armor, $385 per ton, not to exceed 60 tons; class C-2, armor, no bid. Armor for one battle cruiser: Class A-1, armor, $440 per ton, not to exceed 3200 tons; class A-2, armor, $496 per ton, not to exceed 200 tons; class B, $466 per ton, not to exceed 150 tons; class C-1, armor, $385 per ton, not to exceed 30 tons; class 2, armor, no bid.

Pittsburgh Screw & Bolt Co., Pittsburgh, Pa., class C-1, armor, $448.80 per ton, not to exceed 346.8 tons; class C-2, armor, $2240 per ton, not to exceed 13.2 tons.

Carnegie Steel Co., Philadelphia, Pa., armor for two battleships. Class A-1, armor, $425 per ton, not to exceed 14,479.2 tons; class A-2, turret armor, $486 per ton, not to exceed 820 tons; class B, armor, $460 per ton, not to exceed 602 tons; class C, 1 and 2, armor, no bid. Armor for one battle cruiser: Class A-1, armor, $425 per ton, not to exceed 3043 tons; class A-2, turret armor, $486 per ton, not to exceed 168 tons; class B, armor, $460 per ton, not to exceed 144 tons; class C, 1 and 2, armor, no bid. —*Army and Navy Register.*

COMMENT ON THE BIDS.—The failure of the shipyards to bid on the scout cruisers within the authorized limitations is due to the fact that this is a new type of warship in the United States Navy. Congress gave the Navy Department authority to let the contracts for the building of the battle cruisers on the cost and definite profit system, but did not extend it to the scout cruisers. The shipbuilders are insisting that there is no basis upon which to fix their bids for scout cruisers, and the Navy Department cannot see its way clear to let the contract on terms that will be satisfactory to the bidders.—*Army and Navy Journal.*

The bids for battleships construction submitted October 25, and the bids for scout cruisers, submitted November 1, not having been to the satisfaction of the Navy Department, equipping of several of the government navy yards for battleship construction may follow at once. Navy Department officials say the only bids at all satisfactory were the submarine bids. From these, it is indicated, favorable contracts can be entered into. The Navy Department is scrutinizing bids for the battleships and the cruisers closely, there having been fewer bidders than heretofore, and consequently a narrower choice afforded the department. Conditional bids, it is indicated, are wholly unsatisfactory. A limited price for battleships and cruisers was fixed by Congress, and were the department to take chances of an increase in price of materials and labor, contractors would have no incentive to keep down costs. Attention of the department has been called to possibility of expending at once the $6,000,000 authorized at the last session of Congress for equipment of certain of the navy yards for battleship building. This amount is considered as being available at once for battleship construction at any one of the yards designated in the act, should the department have any trouble in getting satisfactory bids.

It will be several weeks before the contracts for submarines, bids for which were opened at Washington, November 1, are apportioned. It will require some time for the department to analyze the bids and make final awards although it now appears that the Electric Boat Co. and the Fore River Co., which submitted joint bids will get the major part of the contract. The nearest delivery submitted in the bids was by the Electric Boat Co. for commencement in 15 months on certain types and 18 months on others. Lake's first delivery was guaranteed in 22 months with later deliveries running to 24 months for first of certain types. Competitive prices varied little.—*Shipping Illustrated.*

Representatives of the shipbuilders have taken up with the Navy Department the question of the penalty clause in the contracts for the Navy building program, informing the department that they will be unable to bid on the ships if strict enforcement of the penalty clause is insisted upon. The builders are willing to agree to carry out the provisions of the penalty clause providing they can secure material. The steel mills and most of the manufacturers of shipbuilding material are behind with their contracts. This is due to the unprecedented demand for merchant ships. While the tonnage offered for European ports from every part of

the world is greatly increased, the shipyards are scarcely able to keep up with the demand. As most of the European shipyards are busy building war vessels, the merchantmen have been forced to look to the United States and other neutral nations for new ships. This accounts for the fact that all of the shipyards and producers of material for ships have more contracts than they can fill. The manufacturers of shipbuilding material have promised the Navy Department that they will give preference to the yards that are building navy vessels. Already they have shown that they intend to make good their promises by giving the Navy Department some early deliveries. But there is no way by which they can be penalized if they should fail to deliver material to shipyards having contracts for the navy building program. The yards would be compelled to depend largely upon verbal promises. Naturally they wish to be relieved from the penalty clause in the contracts for navy vessels and to be placed on the same basis as the producers of material. The shipbuilders are ready to make promises for prompt work on the ships authorized by Congress, but insist that they should not be required to sign a contract with a penalty clause in it under the present conditions of the iron and steel market.—*Army and Navy Journal.*

NAVY SELECTION BOARD.—The Secretary of the Navy on November 8 designated the following nine members of the board of rear admirals to select line officers due for promotion, as provided by an act of Congress approved August 29, 1916:

Admiral Henry T. Mayo; Vice Admiral De Witt Coffman; rear admirals Austin M. Knight, Nathaniel R. Usher, Frank F. Fletcher, Walter McLean, Augustus F. Fechteler, Albert Gleaves and Albert W. Grant.

The board will convene at the Navy Department on December 2, 1916, to carry out the following provision of the above mentioned act:

Hereafter all promotions to the grades of commander, captain and rear admiral of the line of the navy, including the promotion of those captains, commanders and lieutenant commanders who are, or may be, carried on the navy list as additional to the numbers of such grades, shall be by selection only from the next lower respective grade upon the recommendation of a board of naval officers as herein provided.

The board shall consist of nine rear admirals on the active list of the line of the navy not restricted by law to the performance of shore duty only, and shall be appointed by the Secretary of the Navy and convened during the month of December of each year and as soon after the first day of the month as practicable.

Each member of said board shall swear, or affirm, that he will, without prejudice or partiality, and having in view solely the special fitness of officers and the efficiency of the naval service, perform the duties imposed upon him as herein provided.

The board shall be furnished by the Secretary of the Navy with the number of vacancies in the grades of rear admiral, captain and commander to be filled the following calendar year, including the vacancies existing at the time of the convening of the board and those that will occur by operation of law from the date of convening until the end of the next calendar year, and with the names of all officers who are eligible for consideration for selection as herein authorized, together with the record of each officer: *Provided,* That any officer eligible for consideration for selection shall have the right to forward through official channels at any time not later than 10 days after the convening of said board a written communication inviting attention to any matter of record in the Navy Department concerning himself which he deems important in the consideration of his case: *Provided,* That such communication shall not contain any reflection upon the character, conduct or motives of or criticism of any officer: *Provided, further,* That no captains, commanders or lieutenant commanders who shall have had less than four year' service in the grade

in which he is serving on November 30 of the year of the convening of the board shall be eligible for consideration by the board: *Provided, further,* That the recommendation of the board in the case of officers of the former Engineer Corps who are restricted by law to the performance of shore duty only and in that of officers who may hereafter be assigned to engineering duty only shall be based upon their comparative fitness for the duties prescribed for them by law. Upon promotion they shall be carried as additional numbers in grade.

The board shall recommend for promotion a number of officers in each grade equal to the number of vacancies to be filled in the next higher grade during the following calendar year: *Provided,* That no officer shall be recommended for promotion unless he shall have received the recommendation of not less than six members of said board: *Provided further,* That the increase in the number of captains herein authorized shall be made at the rate of not more than 10 captains in any one year.

The report of the board shall be in writing, signed by all of the members, and shall certify that the board has carefully considered the case of every officer eligible for consideration under the provisions of this law, and that in the opinion of at least six of the members the officers therein recommended are the best fitted of all those under consideration to assume the duties of the next higher grade, except that the recommendation of the board in the case of officers of the former engineer corps who are restricted by law to the performance of shore duty only, and in that of officers who may hereafter be assigned to engineering duty only, shall be based upon their comparative fitness for the duties prescribed for them by law.

The report of the board shall be submitted to the president for approval or disapproval. In case any officer or officers recommended by the board are not acceptable to the president, the board shall be informed of the name of such officer or officers, and shall recommend a number of officers equal to the number of those found not acceptable to the president and if necessary shall be reconvened for this purpose. When the report of the board shall have been approved by the president, the officers recommended therein shall be deemed eligible for selection, and if promoted shall take rank with one another in accordance with their seniority in the grade from which promoted: *Provided,* That any officers so selected shall prior to promotion be subject in all respects to the examinations prescribed by law for officers promoted by seniority, and in case of failure to pass the required professional examination such officer shall thereafter be ineligible for selection and promotion. And should any such officer fail to pass the required physical examination he shall not be considered, in the event of retirement, entitled to the rank of the next higher grade.

Under ordinary proceedings the board should be able to report to the president in time so that the nominations of the officers selected for promotion can be sent to the Senate before the Christmas holidays. It is evident that the board will have quite a task before it in filling all the vacancies that have been created by the personnel legislation, in addition to those that have occurred since the act was passed. While the president may, as indicated in the last paragraph above, reject any of the officers recommended by the selecting board, it is not probable that he will exercise this authority. If the chief executive should adopt such a policy the Senate would be very apt to follow his example and hold up the nominations. In some quarters it is believed that the Senate is looking for an excuse to assume this attitude toward the nominations that are selected by the board. Especially would the Senate Committee on Naval Affairs be inclined to hold up the nominations if there were many junior officers promoted in the board's recommendation.

Such a distinguished board as the secretary has selected will doubtless carry a great deal of weight when it makes its report. Neither the president nor the secretary will overrule it without looking into its recommendations with great care.

Under the provisions of the law only captains, commanders and lieutenant commanders who have had four years' service in their respective grades can be taken under consideration by the selecting board in recommendations for promotion. This will make 54 captains, 63 commanders and 124 lieutenant commanders eligible for promotion. The four years must date back from November 30, 1916.

There are at present four vacancies in the grade of rear admiral, 12 in the grade of captain and 35 in the grade of commander, to be filled by the board. Under the terms of the act, which provides that the number of officers of the line shall be four per cent of the enlisted strength, there would be three more vacancies in the grade of captain. There is, however, another provision which limits the increase in the number of captains to ten for a year, and as a consequence the date of the vacancies for the three additional captains will be postponed until January 1, 1917.

The board by the instructions of the Secretary of the Navy is required to recommend officers for promotion to the prospective vacancies which will occur up to July 1, 1917. It is now estimated that for that period there will be one vacancy in the grade of rear admiral, six in the grade of captain and 10 in the grade of commander. At its discretion the board can also recommend the promotion of captains who are only on engineering duty. There is nothing in the law to designate how many of this class of officers are to be recommended by the board for promotion. It is specified that any of the officers exclusively on engineering duty who are promoted to the grade of rear admiral will be extra numbers. There are 14 captains who are eligible to promotion under this provision.—*Army and Navy Journal*, 11/11.

NAVAL CONSULTING BOARD.—The members of the Naval Consulting Board met in Washington on September 19, to take the oath of allegiance prescribed by the recently enacted naval appropriation law, which gives legal status to the members of this body. Those present were Thomas A. Edison, Hon. Mem. Am. Soc. M. E.; Dr. M. R. Hutchison, Mem. Am. Soc. M. E.; Dr. W. R. Whitney and Dr. L. R. Baekeland, both members of the American Chemical Society; Frank J. Sprague, Mem. Am. Soc. M. E.; R. S. Woodward, President of the Carnegie Institute, and Professor Arthur G. Webster, both members of the American Mathematical Society; A. M. Hunt, Mem. Am. Soc. M. E.; Spencer Miller, Mem. Am. Soc. M. E., and William Le Roy Emmet, Mem. Am. Soc. M. E., both representing the Society; Matthew B. Sellers and Hudson Maxim, representing the American Aeronautical Society; Dr. Peter Cooper Hewitt and Thomas Robins, representing the Inventors' Guild; Howard E. Coffin, Mem. Am. Soc. M. E., and Andrew L. Riker, Mem. Am. Soc. M. E., representing the Society of Automobile Engineers; Elmer A. Sperry, Mem. Am. Soc. M. E., representing the American Society of Aeronautic Engineers; Wm. L. Saunders, Mem. Am. Soc. M. E., representing the American Institute of Metals; and Lawrence Addicks, Mem. Am. Soc. M. E., representing the American Electrochemical Society. Four members of the Board were unable to attend the meeting, namely, B. G. Lamme, of the American Institute of Electrical Engineers; Alfred Craven, of the American Society of Civil Engineers; Benjamin B. Thayer, of the American Institute of Mining Engineers, and Dr. J. W. Richards, of the American Electrochemical Society.

The board elected Mr. Edison as chairman, Messrs. Saunders and Hewitt as vice-chairmen, and Mr. Robins as secretary. Considerable time was given to the discussion of plans for the establishment of the $1,500,000 naval research laboratory to be built by the government, and a special committee consisting of Messrs. Edison, Whitney, Baekeland, Sprague, Robins and Addicks was appointed to report to the board as to the best site for it. It is stated that while most of the members of the board favor the selection of New York City, officials of the Navy Department prefer Washington as a site, in order to have the laboratory close to the Navy Department, the

naval gun shops, and the naval proving grounds.—*Journal of Am. Soc. of Mech. Engineers*, October.

DEFENCE COUNCIL'S ADVISORY MEMBERS.—Following out the provision in the Army Appropriation Act creating the Council of National Defence, which authorizes the appointing of "an advisory commission consisting of not more than seven persons, each one of whom shall have special knowledge of some industry, public utility or the development of some natural resource," President Wilson announced the names of the members of this advisory commission on October 11. The seven men are: Daniel Willard, president of the Baltimore & Ohio Railroad; Samuel Gompers, president of the American Federation of Labor; Dr. Franklin H. Martin, of Chicago; Howard E. Coffin, of Detroit; Bernard Baruch, of New York; Dr. Hollis Godfrey, of Philadelphia; and Julius Rosenwald, of Chicago.

In connection with this list of names President Wilson issued the following statement:

"The Council of National Defence has been created because the Congress has realized that the country is best prepared for war when thoroughly prepared for peace. From an economic point of view there is now very little difference between the machinery required for commercial efficiency and that required for military purposes. In both cases the whole industrial mechanism must be organized in the most effective way.

"Upon this conception of the national welfare the council is organized in the words of the act 'for the creation of relations which will render possible in time of need the immediate concentration and utilization of the resources of the nation.' The organization of the council likewise opens up a new and direct channel of communication and co-operation between business and scientific men and all departments of the government, and it is hoped that it will in addition become a rallying point for civic bodies working for the national defence.

"The council's chief functions are: 1. The coordination of all forms of transportation and the development of means of transportation to meet the military, industrial and commercial needs of the nation. 2. The extension of the industrial mobilization work of the committee on industrial preparedness of the Naval Consulting Board. Complete information as to our present manufacturing and producing facilities adaptable to many sided uses of modern warfare will be procured, analyzed and made use of.

"One of the objects of the council will be to inform American manufacturers as to the part which they can and must play in national emergency. It is empowered to establish at once and maintain through subordinate bodies of specially qualified persons an auxiliary organization composed of men of the best creative and administrative capacity, capable of mobilizing to the utmost the resources of the country.

"The personnel of the council's advisory members, appointed without regard to party, marks the entrance of the non-partisan engineer and professional man into American governmental affairs on a wider scale than ever before. It is responsive to the increased demand for and need of business organization in public matters and for the presence there of the best specialists in their respective fields. In the present instance the time of some of the members of the advisory board could not be purchased. They serve the government without remuneration, efficiency being their sole object and Americanism their only motive."

Daniel Willard began his career on the Central Vermont Railroad as a track laborer. He was mainly responsible for the Interstate Commission granting the railroads an increase of rates in 1913. He is a trustee of Johns Hopkins University.

Samuel Gompers, as head of the American Federation of Labor, has devoted much of his time to framing and promoting labor legislation. He was largely responsible for the creation of the National Department of Labor. He helped form the National Civic Federation to establish better relations between labor and capital. He has consistently refused to accept public office.

Dr. Franklin H. Martin, one of America's greatest surgeons, was born at Oconomowoc, Wis., 59 years ago. His home is in Chicago. He is secretary-general of the American College of Surgeons.

Howard Earle Coffin was one of the two men designated by the Society of Automobile Engineers at the request of Secretary Daniels to become members of the Naval Consulting Board. He is chairman of the Committee on Production, Organization and Standardization. He was one of the pioneers in the automobile industry and is well known for his work in connection with the preparedness movement.

Bernard M. Baruch has been a member of the New York Stock Exchange since 1899 and is a member of its board of governors. He is a graduate of the College of the City of New York and is one of its trustees. He was one of the first civilians to urge naval and military preparedness.

Dr. Hollis Godfrey is president of Drexel Institute at Philadelphia. He has been in turn a business man, engineer and educator. He outlined a course in industrial engineering for the Society for the Promotion of Engineering Education, and has served as a lecturer and as consultant in a number of educational institutions.

Julius Rosenwald, is the president of Sears, Roebuck & Company, of Chicago. He is the president of the Associated Jewish Charities of Chicago and a member of innumerable bodies and committees dealing with civic, philanthropic and educational problems, among them the Chicago Peace Society. He is also president of the board of trustees of the Chicago Bureau of Public Efficiency.—*Army and Navy Journal*, 14/10.

NATIONAL RESEARCH COUNCIL.—Arrangements have just been completed in New York whereby the resources of The Engineering Foundation, under the auspices of the four principal national engineering societies, are placed at the disposal of the National Research Council, which was appointed by the National Academy of Science at the request of President Wilson. The object of the council is to co-ordinate the scientific research work of the country in order to secure efficiency in the solution of the problems of war and peace. The council was without funds until The Engineering Foundation, established to further scientific and engineering research, offered to place its resources at the council's disposal, including the services of its secretary, Dr. Cary T. Hutchinson, to act as secretary of the council. The offer was accepted and plans for immediate activities have been placed in the hands of an executive committee.

In indicating how thoroughly every branch of science and engineering is represented in the council, Dr. George E. Hale, director of the Mt. Wilson Solar Observatory, and chairman of the council, who was in New York last week attending to the details of the arrangement, called attention to the personnel of the body, saying that it is the purpose of the council to enlist the cooperation, in the solution of our industrial and military problems of a scientific character, of every possible established agency. Medicine, for example, is represented on the council by Dr. William H. Welch, president of the National Academy of Science; Brigadier General William C. Gorgas, surgeon general of the United States Army; Dr. Simon Flexner, director of the Rockefeller Medical Institute, and Dr. Victor C. Vaughan, past president of the American Medical Society; biological science by Dr. Edwin G. Conklin, professor of zoology, Princeton University; chemistry by Dr. A. A. Noyes of Massachusetts Institute of Technology and Dr. L. H. Baekeland; physics by Dr. A. A. Michelson of the University of Chicago; and electricity by Professor M. I. Pupin, of Columbia University.

These branches, with the exception of medicine, are in the realm of pure science. Recognizing, however, that the practical applications of the principles which the pure scientists discover rest largely with engineers there is a strong representation from the great engineering societies. Clemens Herschel, president of the American Society of Civil Engineers; John J.

Carty, chief engineer of the American Telephone & Telegraph Company; Gano Dunn, president of the J. G. White Engineering Corporation; C. E. Skinner, director of the research laboratory of the Westinghouse Company, and Dr. W. R. Whitney, director of the research laboratory of the General Electric Company are among those who will represent the engineering side of the council's work.

The important military aspects will be presented to the council by Major General William Crozier, chief of ordnance of the United States Army; by Lieutenant Colonel George O. Squier, chief of aviation of the United States Army, and Chief Constructor David W. Taylor, United States Navy. Other branches of the government are represented by Dr. S. W. Stratton, director of the National Bureau of Standards; Van H. Manning, director of the Bureau of Mines, and Professor Chas. F. Marvin, chief of the United States Weather Bureau.

It will thus be seen that the council includes representatives of all of the important scientific activities bearing on military or industrial problems. The executive committee's plans are of wide scope, the support already pledged, will insure immediate action where the need is greatest.

Our English brethren by a similar organization have been of immense assistance to their government during the war. The American organization now being perfected should be of equal value to its government, but it is hoped that the benefits industrially will be no less important than the military ones.

The other members of the council are Dr. John A. Brashear, Pittsburgh; Dr. W. F. M. Goss, dean of engineering, University of Illinois; Dr. William H. Holmes, curator, United States National Museum; Dr. W. W. Keen, president, American Philosophical Society; Prof. E. C. Pickering, director, Harvard College Observatory; Mr. Charles F. Rand, president, United Engineering Society; Prof. Theodore W. Richards, Harvard University; Prof. R. A. Millikan, University of Chicago; Mr. Ambrose Swasey, Cleveland; Dr. Elihu Thomson, Swampscott, Mass.; Dr. C. R. Van Hise, president, American Association for the Advancement of Science; Dr. Charles D. Walcott, secretary, Smithsonian Institution; Dr. J. M. Coulter, professor of botany, Princeton University; Prof. R. H. Chittenden, dean of Sheffield Scientific School, Yale University; Prof. Raymond Pearl, biologist, Maine Experiment Station, Orono, Me.; M. T. Bogert, professor of organic chemistry, Columbia University.

Other members of the council will be appointed from time to time as the needs of the work dictate.—(Press Notice from Office of *The Engineering Foundation.*)

CONCLUSION OF INDUSTRIAL INVENTORY.—The industrial inventory work of the Naval Consulting Board Committee on Production, Organization, Manufacture, and Standardization, popularly known as the industrial preparedness committee, has been practically completed. The inventories collected by the local state boards are nearly all in the New York office of the committee. It is expected that in case it shall not be possible to obtain inventory reports direct from any companies the state directors will send information available regarding them. Inventories were sent to all manufacturing companies doing an annual business of $100,000 or over, of which there are about 30,000. A number of smaller companies are also being inventoried. At present the inventory is about two-thirds completed.

The work conducted by the industrial prepardness committee, of which Howard E. Coffin, a society representative on the national consulting board, is chairman, has been divided into three parts: 1, the taking of an industrial inventory showing what the country can produce in the way of navy and army supplies in case of need; 2, the making of arrangements whereby annual educational orders for such supplies shall be given to manufacturers through the country; 3, the creation of an industrial reserve in which the skilled labor of the country will enroll so that it shall not enlist in the army or navy in case of war.

The active work of the committee has been under way only about six months, but in that time the first part of its work has been practically completed, and the other two parts mentioned are well advanced. In accomplishing this great work the committee has had the active cooperation of the state directors representing five national engineering organizations; of commercial associations through the country, such as the Chamber of Commerce of the United States and local business organizations; and, finally, of the Associated Advertising Clubs of the World, a committee from which has prepared advertising copy and arranged for its publication. The poster department of this organization has done valuable and patriotic work, placing upon the billboards from coast to coast graphic posters carrying the message for industrial preparedness. Separate and distinct from the advertising men's work, the committee on industrial preparedness has conducted an educational campaign of its own in the news columns of American publications, placing about 5000 columns of space during the past four months.

The rest of the committee's program will be carried out as authorized by legislation enacted recently as a result of remarkable widespread educational effort. The army reorganization act is already in effect, and the army appropriation bill has passed both houses of Congress and been signed by President Wilson. This legislation creates a council of national defence consisting of the secretaries of the War, Navy, Interior, Agriculture, Commerce and Labor Departments and of an advisory commission to be constituted of not more than seven persons having special knowledge of industrial affairs or otherwise qualified specially for participation in the work of the council. It is probable also that the present engineering organization, consisting of 240 state directors, who are associate members of the Naval Consulting Board, will be continued for the purpose of cooperating with the council of national defence. In addition, the legislation provides for the placing of educational orders with manufacturers. An officers' and enlisted men's reserve corps is also to be created by means of which an industrial reserve will be provided.

The council of national defence is given power, working in normal time of peace, to create "relations which will render possible in time of need the immediate concentration and utilization of the resources of the nation." Thus in less than six months the industrial preparedness committee has completed the first step of its program and been an important means in the provision of necessary governmental machinery for the making of the other two steps. It should be a source of gratification and pride to every member of this society that an S. A. E. representative on the Naval Consulting Board has been in responsible charge of this great constructive work.—*Army and Navy Register*, 16/9.

SALVAGE OPERATIONS.—*Shipping Illustrated* informs us that the report of the board convened to investigate the condition of the *Memphis* indicates that no attempt to salvage the vessel will be made. The *Memphis* had a draft of 25 feet and now lies on a rock bottom in from 12 to 19 feet of water. Salvage operations on the *Hector* have been postponed until spring on account of the heavy seas and high winds now prevailing off Cape Romain.

MARINE REGIMENTAL ORGANIZATION.—As soon as the exigencies of the service will permit, the several regiments of marines maintained for expeditionary and similar service, which, of course, are provisional organizations, will be formed on the basis of approximately 1400 enlisted men to a regiment. Each regiment will include three infantry battalions, each of three companies of 100 men each, one machine-rifle company of 100 men having 16 guns, one artillery company of 100 men having four 3-inch landing guns, one signal company of 100 men, and one headquarters detachment of 100 men, including the regimental band. Probably the first organization to be placed on this basis will be the fourth regiment, now in

Santo Domingo, whose home station is San Diego, Cal. Four additional companies are being organized for this regiment at Mare Island, Cal., and as soon as they are ready for service they will be sent to San Diego.—*Army and Navy Register*, 28/10.

ENGAGEMENT IN SANTO DOMINGO.—In an engagement in Santo Domingo on October 24, between members of the fourth regiment of marines and Dominigan rebels, Captain William W. Low and First Sergeant Frank L. Atwood were killed, and First Lieutenant Victor I. Morrison was slightly injured by falling off his horse, which was shot. The American forces attempted to arrest General Ramon Batisti, who resisted and ordered an attack. The fighting continued for a considerable time, but the rebels eventually were defeated, and Batisti was killed.—*Army and Navy Register*, 28/10.

MARINE RIFLEMEN WIN TEAM MATCH.—The national team match of the National Board for Promotion of Rifle Practice was won by the United States Marine Corps team, which scored 3047 points out of a possible 3600.

The marines also won the united service match trophy. The marines, represented by a team of 16 men, took this event with a total of 4320 points out of a possible 4800.

The National Guard team got second place in the service match, making 4212 points. Third honor went to the civilian team, which aggregated 4120 points.

In the national team match, regarded as the shooting classic of the nation, and in which 55 teams were entered, the New York National Guard team was second, with 3037 points, and the Pennsylvania National Guard team third with 3005.

The winning team of 12 marines got the title of national team champion and the national trophy, and each marksman received a medal. To the New York guardsmen went the Hilton Trophy, and to Pennsylvania's representatives was awarded the bronze soldier of Marathon.—*N. Y. Herald*, 26/10.

FATAL ACCIDENT TO NAVY AVIATORS.—Lieuts. (J. G.) Luther Welsh and Clarence K. Bronson, U. S. N., were killed instantly November 8, 1916, by the explosion of an airplane bomb which they were testing during a flight over the Indian Head (Md.) Naval Proving Grounds during experimental work in testing bombs for use against vessels. The official statement made by the Navy Department concerning the accident says: "The bomb detonated immediately beneath the aeroplane. It was being launched by Lieutenant Welsh, and apparently struck some part of the aeroplane. It was seen to detonate, and the aeroplane broke in two and fell into the river. Hardly any trace of the aeroplane or passengers has been located yet. This occurred about 25 minutes to 3 o'clock p. m., November 8. The experiments were being conducted by Lieutenant Wilkinson, as representative of the Bureau of Ordnance."

The machine, it is said, was at an altitude of about 1000 feet at the time of the accident.—*Army and Navy Journal*, 11/11.

TESTS OF NAVAL ORDNANCE.—The new 45-caliber, 16-inch type gun built for the navy has been undergoing a series of very thorough tests, and so far with gratifying results. It is 60 feet in length, weighs about 80 tons, and fires a projectile weighing 2100 pounds, with a muzzle energy of approximately 100,000-foot tons. Up to the present time the tests have been of a general character; but last week the gun was tried out with an armor-piercing shell against a 13-inch Krupp plate. The plate had behind it the usual heavy backing of timber and sand, there being a mass of sand banked up against the backing and extending for some 30 or 40 feet behind it.

The shell made a clean perforation of the armor, timber and sand backing, was deflected, and traveled about three-quarters of a mile further, finally passing through the cottage of a government employee at the Indian Head Proving Ground. Fortunately, no one was injured. The shell doing the enormous amount of work involved in the perforation or armor, backing and sand-bank came to rest fairly intact.—*Scientific American.*

ARMORED RAILWAY CAR.—The first armored railway car ever built for the United States Army was tested at the Sandy Hook Proving Grounds. The car, which is of 40 tons, mounts on its top one 3-inch field gun, and has ports in its armored sides from which 20 machine guns can be operated, was designed by the corps of engineers and was built by the Standard Steel Car Company of Hammond, Ind. The car was completed and delivered in just 27 days after the order was placed, and $1,000,000, it is said, will purchase and equip about 20 trains of 10 cars each.

The car has been described as a moving block house, built of heavy steel, and intended for patrol work and for action against mobile troop organizations. It is not intended to resist artillery fire, although cars of that type are also said to be a matter of study in the army at present. As a matter of fact, one gondola car which mounts a single 4.7-inch howitzer is now at Sandy Hook waiting to be tested. This car was built by the Ordnance Department.

The car is officially known as a light armored car, and the single 3-inch gun which will be operated from it is mounted in a well on the top and in the center of the car. The gun-well may also be used as a fighting top for troops using either machine guns or rifles. The 20 machine gun ports in the car are arranged eight to a side and two at each end. In addition, there are six observation ports. The car may be entered through steel doors from either side and from both ends.

The interior of the car is divided into three compartments, the two end ones being those from which the machine guns will be operated, while the center space will be used as the ammunition room. About 20 men are required to man the car, but in an emergency twelve could keep all of its guns in action. The car weighs about 80,000 pounds, is about 48 feet long, 10 feet wide and is operated on two sets of heavy trucks.

The result of yesterday's tests, which involved the fighting of the car both under way and still, will not be made public at this time. Unofficially, however, officers said last night that there was no doubt that the car stood the tests to the satisfaction of every officer who witnessed them.

ARMY MACHINE RIFLES.—Immediate purchase of 4600 Vickers machine guns of the present adopted heavy type and the subsequent purchase of a total of 8015 heavy type and 9268 light type machine guns within the next four years are recommended in the report of the special board appointed in September by Newton D. Baker, Secretary of War, to consider the quantity and character of machine guns required for the army.

One of the chief reasons for assembling this board was to settle a controversy which has long raged in army circles regarding whether the United States Army is employing the best type or types of machine guns, and specifically to determine the reliability and value of the Lewis machine gun, which is reported to have rendered extraordinary service in the allied armies in Europe. The Lewis gun is a light type of machine rifle.

The board made no finding as to the relative value of types of light machine guns, but recommended that a test of such guns be conducted at the armory at Springfield, Mass. In that test the Lewis gun, the Benet-Mercier, the Colt and other types will be tried out, and the widest range will be given to the experiments, including firing from aeroplanes.

The board report states:

"Should this country become engaged in war in the near future the board recommends the purchase of all Vickers machine rifles that the Colt's Patent Firearms Manufacturing Company, all Lewis guns that the Savage

Arms Company and all Colt rifles that the Marlin Arms Corporation can make until the total quantity required is procured."—*N. Y. Herald.*

The results of various tests of machine guns are given under the heading "Ordnance and Gunnery" in this issue of the PROCEEDINGS.

PROGRESS IN AVIATION.—*Aviation* publishes a report that the Pensacola Aeronautic Station has abandoned the use of the open type pusher seaplane for school purposes and that a recent order for 30 new machines includes only those of the tractor type. Press reports state that the total number of seaplanes contracted for by the navy is 75, 26 of which are actually under construction. A dirigible balloon and two kite balloons are also being built. It is understood that the kite balloons will be installed on the *Oklahoma* and *Nevada* for experimental work. The army has issued specifications for seaplanes which provide for machines of the biplane or triplane type, fitted with two motors with a total of from 170 to 300 horse-power and capable of making a sustained flight of five hours' duration with pilot and observer. The army signal corps is taking energetic measures to develop a suitable airplane as the following extract from the *Army and Navy Journal* shows:

"The signal corps of the U. S. Army has opened its campaign of preparation for enlarging the aviation section of the army by issuing a memorandum on 'Military Aeroplanes' that is declared to be the 'most important announcement that the War Department has ever issued in regard to aeronautics,' and which will startle many constructors by its first announcement, which submits 'that the type of aeroplane which all constructors have attempted to build in this country, the so-called two-place reconnaissance tractor biplane with one motor, is a false development.'

"This memorandum was prepared in the office of Lieut. Col. George O. Squier and is entitled, 'Memorandum on the Future Developments of Military Aeroplanes for the Army Air Service and Proper Motive Units Therefor.' It is published in *Aviation and Aeronautical Engineering* for September 15, and in sending the memorandum to the editor of that publication the Signal Office wrote: 'The purpose of this memorandum is to initiate discussion.' That it is likely to there can be no doubt, for its criticism of existing types of American machines obviously comes from a profound and wide-angled knowledge of flying machines used in the present European war as well as of the development of native aeroplanes, Colonel Squier having been the first passenger carried by the Wrights in one of their machines; and in the two years of the European war he has had unusual opportunities to study the lessons of the war as it affected the air service in particular.

"The signal corps memorandum points out that while it is impossible at this date to predict with any degree of accuracy what the development in the design of military aeroplanes will be a few months hence, it must help the motor builders by giving them all the information at the disposal of the aviation section of the signal corps upon which to base their efforts. Its first criticism is that we have already quoted against the two-place tractor biplane, 'its reason for being appearing to be a natural growth from the tractor training machine.' The deduction is that 'it has been much simpler and easier to design by increasing the scale than to design a new.' The existing type would be all very well if the U. S. Army was fighting an enemy unarmed with aeroplanes for long range reconnaissances, but 'it appears to be utterly at the mercy of an attacking aeroplane' of the *Pursuit* type (the fast, strong climbing, one man, with machine gun) or the larger type capable of carrying a load of bombs, of considerable radius of action, and of fighting an aeroplane whether it be in front or to the rear.

"For the pursuit type the memorandum suggests that we can safely follow in this country such successful types in Europe as the Fokker, Nieuport and the Vickers, among others, specifying that ours will be

biplanes. In case of war our army would require 21 per cent of its supply of aeroplanes to consist of these machines. For the larger type a machine of 260 horse-power is suggested, the power being obtained from one or two units, as, for the present, a thoroughly developed motor of over 200 horse-power cannot be obtained. Such a flying machine has unusual versatility and can carry gasoline enough for 600 miles' flight and nearly 500 pounds in bombs in the extreme of both of these elements of operation. Such a machine could carry two men and would be an ideal 'strategical' two-man reconnaissance machine capable of defending itself from attack. It could be easily changed to carry three men and be an ideal 'combat' machine to act as escort to our bomber. If a third man was not carried or a great weight in bombs it could be possible to substitute pontoons for the landing wheels and thus obtain a military hydroaeroplane which should be very versatile in its functions. Twenty-eight per cent of this type of machine would be required of our total of aeroplanes in war time.

"Special types that would be required by our army will include machines especially designed for scouting over mountains or forest-covered country, of which there is a large extent in the United States, 20 per cent of these being required, according to the memorandum, in time of war. In order that these aeroplanes may land in narrow roads at very low speed or in restricted areas in such country, the span should be kept very small. Future military service may also require twin motored machines for carrying very large bombs or for extreme long range duty as seaplanes with two motors of about 180 horse-power each, the motors probably being of the 12-cylinder V water-cooled type. It may be in addition to these that a primary training machine, the prototype of the French school *Penguin*, should be designed and developed with a view to driving it with a standard automobile motor of, say, 70 horse-power, the motor to be run normally at a speed to give about 40 horse-power. Such machines might be turned out quickly and cheaply in case of emergency for training a large number of novices rapidly, as at the outset of war."

Meanwhile the War Department has issued a general order providing for the formation of the "Aviation Section, Signal Officers Reserve Corps," limiting the section to 296 officers. The Aero Club of America protests that at least 1000 civilian aviators must be trained and has asked that the size of the Reserve Section be increased to accommodate as many as possible of the 1200 candidates who have applied.

FUEL OIL FOR THE NAVY.—The bureau of supplies and accounts of the Navy Department has completed estimates of the fuel oil consumption of the United States Navy for 1917, and announced a total of 50,000,000 gallons. It is expected that the demands of the government for fuel oil for its vessels will increase as the years go on. It is estimated that the United States controls 60 per cent of the total supply of the world. If Mexico were included in this estimate it would bring it up to about 75 per cent of the total supply. The geological survey has figured that there is at present in sight in the United States a sufficient supply of oil to meet all the demands for the next 60 years, allowing for an increase in the use of oil and gasoline each year.—*Washington Star*, 25/9.

FOREIGN MILITARY SERVICE AND CITIZENSHIP.—Service in a foreign army or navy does not necessarily deprive an American of his citizenship, in the opinion of the Judge Advocate General of the Navy. The opinion was rendered in the case of George F. Saunders, who made application for enlistment at the naval recruiting station in Pittsburgh. The Judge Advocate General in reviewing the case held that if he had not actually expatriated himself by a concrete act of swearing allegiance to a foreign power, the mere service in the army of another country did not deprive

him of his citizenship. In this connection attention has been called by other officers on duty at the Navy Department to the fact that citizens of foreign countries have frequently served in the U. S. Army.—*Shipping Illustrated*, 11/11.

BETHLEHEM STEEL COMPANY TO BUILD PROVING GROUND.—The world's greatest proving ground for ordnance is to be established near Nay's Landing, N. J., by the Bethlehem Steel Corporation. A statement to this effect was made yesterday at a meeting of the New Jersey State Board of Conservation and Development, in Trenton, following an application made by the corporation for permission to purchase from the state 300 acres of timber land which is in the heart of the proposed reservation and which is needed to make possible the realization of the project.

The site of the proposed proving plant is about 20,000 acres in extent and runs for 18 miles along the Great Egg Harbor River. Both in size and in equipment the new proving plant will surpass the famous Krupp grounds in Germany. To a large extent the new plant will be used in the testing of ordnance of various calibers built by the Bethlehem Corporation for the United States Government. It will also be the place where the various types of ordnance built for foreign governments will be first tested. —*N. Y. Times*, 3/10.

UNITED STATES NAVAL MILITIA AND NAVAL RESERVE

FLEET MARINE CORPS RESERVE.—Orders have been issued from the headquarters of the marine corps in regard to the fleet marine corps reserve, which corresponds to the fleet naval reserve. It will be made up of four classes: (a) Former officers of the marine corps that have left the service under honorable conditions; (b) men that have been, or may be entitled to be, honorably discharged from the marine corps after one four-year term of enlistment or after a term of enlistment during minority; (c) enlisted men of the marine corps that have completed 16 years' naval service may, on authority of the major general commandant, on voluntary application on expiration of term of enlistment, if entitled to an honorable discharge, be transferred to the fleet marine corps reserve with the rank then held by them; (d) enlisted men of the marine corps that have completed 20 or more years of naval service may be authorized by the major general commandant, in his discretion, to transfer to and continue in the fleet marine corps reserve at any time during the man's current enlistment. The orders set out the pay, duties and requirements, training, insignia, etc., of members of the reserve.—*Army and Navy Register*, 11/11.

THE NAVAL TRAINING ASSOCIATION.—Another civilian organization to advance the cause of naval preparedness in the United States has been incorporated in New York state with the title of the Naval Training Association of the United States. The purposes of the association, which is an outcome of last summer's naval training cruise, are set forth, in part, in this statement: "The Naval Training Association of the United States does not enter the field occupied by the naval militia. Naval militia organizations exist only in comparatively few localities, rendering it impossible for large numbers residing outside those localities to obtain the training so afforded. Most of those who took part in the naval training cruises of 1916 are men whose occupations and activities have made them unable to enlist in the naval militia and devote the time and painstaking service required by that organization. It is to meet the requirements of men who are unable to join the naval militia and who are nevertheless useful material for naval service that the association advocates naval

training cruises, schools, camps, or other forms of instruction. One of the purposes of the association is to make use, as far as may be practicable, of the facilities of the navy for such training, including, if possible, the use of the U. S. Naval Academy at Annapolis and the several training stations, when not otherwise occupied, for the training of civilians, and it is also particularly hoped that a period of instruction may annually be held at which boys between the ages of 15 and 19 may be afforded an opportunity for naval training."—*N. Y. Herald*, 11/11.

DISCUSS FAULTS OF POWER BOATS.—In many respects the meeting held in the Vanderbilt Hotel at which the Power Craft Association of the Third Naval District was formally organized, proved to be most interesting, chiefly because several of the officers of the United States Navy spoke at length on the requirements of craft for naval use and the merits or otherwise of the motor boats that took part in the recent maneuvers.

In the course of his remarks Lieut. Commander C. P. Nelson, U. S. N., said that the chief trouble with several of the craft was that they were not strongly enough built to stand the kind of work called for. A few days in a heavy sea-way caused doors, drawers and various portions of the interior woodwork to work loose or out of shape.

In addition he said that the operation of 25-knot craft with others capable of 10 knots in maneuvers was just so much wasted endeavor, as the speedier ones had to be throttled way down all the time. More speed is needed for the submarine chasers and for a few other purposes, he said, but made it plain that there were numerous other uses for the slow going cruisers, including mine planting.

However, many of the motor-boats were structurally weak, and strength is even more important than speed and must not be sacrificed where speed is obtained. As regards the chasing of submarines he said: "The 12-knot motor-boat hasn't a burglar's chance, and in the case of the 30-knot craft it is nearly a certainty of her proving effective in the course of an hour's chase.

Another feature which Lieut. Commander Nelson called attention to was that the recent maneuvers terminated just when the men were getting to be proficient, and he suggested longer and more frequent maneuvers next year.

Commander L. A. Kaiser, U. S. N., urged the necessity of getting together and doing things. He said the Navy Department should do everything possible to help the movement and encourage owners to take an active interest in the preparedness movement. He said he was sure naval officers would do all in their power to help things along.

One of those present said: "We have only begun to prepare. We are a little tardy, but I hope not too late."

The present movement is much like the British organization, and the naval officers expressed the belief that local clubs cannot be without federal control, the government having the right to order all New York craft to other districts when thought desirable.

The subject of federal or even state control was one which the owners of power craft who were present were decidedly interested in, and many of them made sure that the newly formed association had no federal or state strings attached that would bind them to service before they signed up.

The recent and even present experiences of national guardsmen has made nearly all motor-boat owners wary of everything of a similar nature, not because they are unwilling to turn their craft over to the country in time of actual need and their own services as well, but because they do not care to be taken away from their homes for prolonged duty that might just as well be done by others who have the time and inclination to serve.

One of the naval officers suggested that in the event of the craft being put under federal control the rank of volunteer lieutenant might be

conferred upon owners of such power-boats; but even the dignity of a federal title would not change the minds of a great majority of the owners.

It is proposed by the members of the new association that they attend frequent blackboard talks and lectures on subjects pertaining to the duties involved in naval maneuvers, and they have been assured that naval officers will be glad to render their services for these affairs.

The objects of the Power Craft Association, Third Naval District, in brief are to unite all owners of power craft possibly useful in time of war; to stimulate and develop the building of such craft and to encourage their enrolment in the Navy Department, with the participation of their owners in annual maneuvers under the direction of the Navy Department, as well as to develop interest in all naval affairs and to advance the interests of the Navy Department.—*New York Herald*, 6/11.

THE BOSTON PATROL SQUADRON.—As a result of the recent naval maneuvers in Boston Harbor, in which power-boats of the Boston Yacht Club's power squadron and several boats unattached took part, plans are already on foot to form a basis quadron of 10 patrol-boats among the Boston yachtsmen for the first naval district. These boats will be of one design and will possibly be 60 feet in length and mount two guns, one forward and one aft, 3-pounders.

The general impression from the maneuvers was that a little larger boat than the 45-footers now in commission in district 2 would fill the bill better for general patrol work, although, for harbor defence, the 45-footers prove effective. Under rough weather conditions the *Scooter*, a 53-footer, owned by John L. Saltonstall, and built on naval specifications, acted well. She averaged from 15 to 21 miles an hour in rough sea with the wind blowing half a gale, and it is this type of boat, says the *Boston Transcript*, which navy officers feel would be best for the government to maintain. Several New York men who have 45-footers are thinking seriously of building larger boats for next season, and the two districts will undoubtedly be defended by fleets of volunteer boats that will be fast and manned by skilled civilian sailors.—*Army and Navy Journal*, 23/9.

NAVY PLANS ALL-YEAR CIVILIAN TRAINING.—The Navy Department has taken action to keep alive the spirit of co-operation awakened in the 2000 civilians who participated in the "naval Plattsburg" cruise in August and September. The first movement in this direction is the making of plans to continue the drill and practice instruction of these civilians by furnishing them an opportunity to report on board any vessel of the reserve force at the several navy yards at least one afternoon and evening drill period per week throughout the year. It is felt that this will stimulate interest among the civilians as well as among the naval officers who come in contact with them.

The department has been assured that with the start thus far made it will be not at all difficult to secure for next summer at least 10,000 men of the same type as those who participated in the cruise just closed. The civilians themselves contemplate a national organization through which they hope to be able to enroll all civilians who participated in the cruise in the volunteer naval reserve or some other class of reserves created by the recent naval bill. They hope that if such enrollment can be effected the department may be able to provide continuous practice instruction and drill throughout the year for those who are situated near the seaboard, and that the scheme for continuous training may permit of one month's intensive training at shore station, to be followed by a month the following summer on board vessels of the reserve force, the course to be completed by one month's service during the third summer on board vessels of the active fleet.

These matters are at present under consideration by the Navy Department, and if the details can be arranged the movement will start in con-

crete form and on a large scale either this winter or early spring, in which case it is confidently believed that next year's enrollment will at least equal the figure, 10,000 suggested by the civilians themselves. When this shall have been accomplished a long step will have been taken both toward the securing of a 100,000 volunteer reserve and in educating the public in thorough preparedness and an adequate navy. And the plans contemplate extension of this training to the Pacific coast and the Great Lakes, so that every section of the country may participate.—*Army and Navy Journal*, 10/6.

REPORT ON SCOUT PATROLS.—After several days of deliberation the naval board appointed to perfect arrangements for the scout patrol boat squadrons, which has held its meetings at the War College, with Rear Admiral Austin M. Knight as president, has sent its report to the Navy Department, which embodies the following subjects:

The boats have been divided into four classes, designated as type A slow, type A fast, and type B, slow and fast. The former type must be not less than 40 feet water line, sufficiently seaworthy to maintain station in harbor in all weather up to a moderate gale, have a speed not less than seven knots, and to be self-sustaining for four men for four days. The armament will consist of one one-pounder and one machine gun. The type A fast boats will be similar, with the exception that they must be able to maintain a speed of 16 knots.

The type B boats recommended are of larger dimensions, the length must be at least 60 feet, and they will be required to keep to sea in a moderate gale. The minimum speed will be 16 knots, and the specifications call for one anti-aircraft gun, fitted for horizontal fire, as large as possible, not less than a 3-pounder, and at least two machine guns. The only difference between the slow and fast is 10 knots for the former and 16 for the latter.

The B type for the latter class must be equipped with radio and searchlights. As there will be some difficulty in procuring sufficient anti-aircraft guns for all those wishing to enroll, a standard type of gun will be allowed prior to the regular equipment. Boats built hereafter for enrollment in the scouting patrol must be of sufficient strength to carry guns, and those already built will be accepted after an inspection by the naval officer in charge if they can be strengthened to meet the requirements.

All owners or officers and crew must be enrolled in the naval coast defence reserve, and will be ranked after three months of service in accordance with the approved type of boat on which they are serving.

In time of peace owners must serve on their boats, but not necessarily in time of war. Training will be held four weeks in the year at the various naval districts, one week being devoted to elementary individual instruction and the other three to the cruise. A simple code of signals with shapes instead of flags has been recommended, and an effort has been made to induce future builders to supply a boat with essentials rather than finish. Among these should be a sheltered station resembling the conning tower of a destroyer.

It will be seen by the foregoing requisites that the speed of 24 knots, which now marks the present type of latest scout patrol boat, has not been asked for, and it is supposed that the reason is that stability would meet the average requirements more than speed. The Navy Department has hopes that many devotees to the sport of motor boating will enlist under the new rules, but it is emphasized from the beginning of the organization that those willing to serve the country in this capacity must realize that they will be subject to the regulations of the United States Navy and that both officers and crew will be treated with the same method of discipline which is proverbial in our present seagoing organization.—*N. Y. Herald*, 13/11.

NAVIGATION AND SIGNALLING

THE USE OF LIGHTS FOR DAYLIGHT SIGNALS.—The practicability of daylight signalling by low power lamps has been established by the adoption of this system by the Pennsylvania Railroad for control of trains. The Pennsylvania uses a 12-volt, 6-watt tungsten lamp, placed in the exact focus of a lens 5½ inches in diameter and having a focus of 2¼ inches. In front of the lens is a convex glass cover of the same diameter, and of such shape that light striking any portion of the cover except its apex will be reflected backward. The apex is frosted in order to diffuse reflection over this portion. This avoids the difficulty of sun glare, which was at first experienced when a flatter cover glass was used.

Over the lamp is a 4-inch spherical mirror placed at such an angle that no light from the lens can be reflected outward. The purpose of this is to give the indication at extremely close range. For signals on curves a special lens is used, having its steps distorted so as to give more side spread to the light. The cover glass is of a pale lemon yellow, distinctive from other "white" lights, contrasting with the blue of daylight, and easy on the eyes of the observers. A hood 11 inches long is placed over the cover glass to concentrate the lamp rays, and to exclude the sun's rays. White lights only are used.

The elaborate precautions against false signals from sun glare observed in the construction of the projectors indicates that it is doubtful if daylight signalling with low power lamps will ever be practicable on board ship.

PROGRESS OF THE MAGNETIC SURVEY OF THE OCEANS.—The non-magnetic yacht *Carnegie*, after a voyage of 200,000 miles, arrived at San Francisco last week and reported progress in the work she has undertaken for the purpose of rectifying magnetic charts. The *Carnegie* left this port March 5, 1915, for the Bering Sea via the Panama Canal, after which she went to Lyttleton, N. Z., and began her important voyage of circling around the South Pole, between latitude 60 and 70 south. She has now completed 75 per cent of the magnetic survey of the world.—*Marine Journal*, 30/9.

OIL NOT A FOG PREVENTIVE.—Prevention of fog at sea in the vicinity of a vessel cannot be accomplished by the distribution of oil on the surface of the water. Reports of experiments along this line, as recommended by the Naval Hydrographic Office, indicate that such distribution of oil had no noticeable effect on the fog. Four reports from navy vessels along the Maine and Massachusetts coasts and on the Deleware River show oil is useless in the diminishing or preventing fog. Off Marous Hook, Pa., where there are a number of oil establishments, the U. S. S. *Melville* on her trial trip ran into a dense fog. Her captain reported that there was thick film of oil on the water for miles around, but the ship was fog-bound 12 hours.—*Army and Navy Journal*, 6/10.

ORDNANCE AND GUNNERY

MACHINE GUN TEST AT PLATTSBURG.—*Report of Tests Made With the Lewis and Benet-Mercier Machine-Guns at Plattsburg, N. Y., June 13 and 14, 1916.*—Two Benet-Mercier and two Lewis guns were used in these tests. A crew of four partially instructed men (civilian attendants, Military Instruction Camp) was assigned to each gun, and one thoroughly instructed man (to reduce jams only) was assigned each two guns. The instructed man with the Lewis guns was furnished by the Savage Arms Company; the one with the Benet-Mercier guns was a non-commissioned officer of the Machine-gun Troop, 2d Cavalry.

Night Firing, June 13, 1916, 8.40 p. m.—The time necessary for each of the guns to go into action was approximately the same—about 15 seconds. A small electric torch light was used while jams were being reduced. Weather, clear, moonlight.

First, 600 yards test. To fire 90 rounds.

BENET-MERCIER	LEWIS
The first gun finished in 1 minute and 15 seconds without a jam. Second gun jammed; cause, stripped shell. Changed barrels after firing some five or ten shots. Remaining shots fired as rifle fire. Would not function because of clogged gas vent in second barrel.	First gun finished in 15 seconds. Second gun jammed (after firing first shot), caused by rack assembling spring not being properly adjusted. The rack was replaced and the gun finished its 94 rounds in 10 minutes, 28 seconds. It was reported to board that second gun had been assembled by civilian attendants in afternoon, and they had failed to adjust spring properly.

500 yards test. To fire 90 rounds.

BENET-MERCIER	LEWIS
First gun, 2 minutes, 1 jam; cause, ejected shell rebounding from wooden post back into chamber. Second gun, first clip, 8 minutes, 20 seconds; second clip, 4 minutes, 40 seconds. Twenty-three misfires. Did not finish clip. Gun out of commission, due to jams caused by clogged gas vent.	First gun, 13 seconds; second gun, 17 seconds.

Second, 600 yards test. To fire 90 rounds.

First gun finished in 1 minute, 45 seconds. Second gun fired 20 shots out of first clip as single firer. Did not finish clip. Changed spring in 3 minutes; fired three shots in second clip. Ceased firing on account clogged gas port.	First gun finished in about 12 seconds. Second gun did not function until eight or ten shots had been fired; finished in 50 seconds. Failure due to insufficient gas pressure.

Day Firing, June 14, 1916, 2.25 p. m.—To fire 470 rounds in the least time. One Benet-Mercier and one Lewis.

BENET-MERCIER	LEWIS
Four minutes, 55 seconds. Seven interruptions, two of which were jams.	Seven minutes, 30 seconds. Necessary to change feed arm and extractor, because of burred feed pall and worn corners on magazines.

To fire the greatest number of shots in two minutes.

150—Four interruptions due to overheating.	752—Nine interruptions due to worn corners on magazine.

Mobility.—Two Benet-Mercier and two Lewis. Each carried by one man, advancing up a steep hill and taking a position on crest. Each was handled with equal ease and facility.

Firing 420 rounds, to be loaded and fired by one man. (One expert to reduce jams only.)

BENET-MERCIER	LEWIS
After firing 35 rounds, firing pin caught, causing serious jam, which after 25 minutes' work was not reduced, and another gun was substituted for next test.	Three minutes, 45 seconds. Three interruptions; one due to failure to feed, the other two to failure to extract.

Sand test. Three Benet-Mercier and two Lewis magazines. The loaded magazines were filled with sand (one with wet and one with dry), and were fired without cleaning, except removal of such sand as fell out when magazines were shaken.

BENET-MERCIER	LEWIS
Fired only eight of ten shots in 5 minutes' firing. Too much head space, causing ruptured shells. Gun would not function and test was stopped.	One minute, 3 seconds (one interruption). Gun then fired four magazines in 53 seconds to demonstrate its functioning without sand being removed from gun.

Two magazines filled with thick mud, gun remaining uncleaned after sand test.

	48 seconds; one jam, due to small gravel in post hole. Lewis fired 20 cartridges with battered shells in 3 seconds. No jams.
Anti-aircraft or aeroplane mount.	No mount available.
No mount available.	Mount fixed on end of upright post. Gun satisfactorily fired from this mount through a vertical arc of at least 45° above and below the horizontal. The gun could have been fired almost vertically either up or down. The gun was also revolved on the axis of the barrel both when clean and during the sand test, and functioned satisfactorily in all positions.

The Benet-Mercier guns used were those of the 2d Cavalry. Lieutenant Gordon states they were in the best possible condition at the time of the test. The Lewis guns were new ones, built according to British specifications, using British ammunition.

It will be noted that the Benet-Mercier guns performed better at the beginning of the test, while the Lewis guns improved with use. It is believed the interruptions in the Lewis guns due to worn corners on circumference of magazine could be prevented by making these corners less rounded.

In the opinion of the board the mobility of the two guns is practically the same. Each can be handled by one man; the size of crew depends simply upon the amount of ammunition carried.

The superiority of the Lewis gun in every other particular was clearly demonstrated. The following special advantages being noted: 1. Simplicity. This was especially important in the night work. 2. The comparative rapidity and ease with which a fresh magazine can be attached and removed in case of jam. 3. More efficient cooling device. 4. Ease in cocking piece for first shot. 5. Comparative ease in reduction of jams.

6. Remarkably satisfactory action in mud and sand tests, and with deformed cartridges.—*Army and Navy Journal*, 23/9.

REPORT OF MACHINE RIFLE BOARD.—The Secretary of War on November 10 approved the preliminary report of the Machine Rifle Board, of which Brig. Gen. Francis H. French, U. S. A., is president. After a lengthy review of former experiments the board made the following general conclusions:

1. That the Vickers machine rifle has been developed to a more reliable state of efficiency than any of the other rifles tested using caliber .30 ammunition.

2. That some of the lighter rifles tested by proper effort on the part of their inventors could be developed, in all probability, to a state of efficiency for the U. S. caliber .30 ammunition, and the board is of the opinion that a lighter rifle better fulfills the requirements of the service for certain special purposes, such as for aeroplanes, use of skirmishers, etc.

The reports of military attachés and military observers and the statements of officers of the Aviation Section of the Signal Corps, U. S. Army, show that the first requisite of a machine rifle for an aeroplane is certainty and reliability of action, and the second requisite is lightness. It is not probable that any cooling device for the barrel of a machine rifle for aeroplane will be necessary.

The features forming the basis for the classification of machine rifles may be stated as follows:

Light type, comparatively light weight, highly portable, without tripod mount, air-cooled, fed from a magazine.

Heavy type, relatively heavy, with substantial tripod mount effectively cooled for continuous fire, fed from a belt.

Each of these types has its special advantages and peculiar functions. The light machine rifle has superior portability and handiness, due principally to absence of tripod mount and the cooling system, and to feeding from a magazine instead of a belt. It can be easily carried by one man to considerable distances, and can be put into action very quickly. Such rifles are ideal weapons for supplementing the fire of riflemen, assisting them in gaining superiority of fire and closely supporting them on all occasions either in attack or defence. They can be used with the advance party or even with the point of an advance guard, and near the line of observation of outposts. In the defence they can be readily shifted to alternate positions to escape the effect of the enemy's artillery fire directed by aeroplanes. They are the first rifles to go forward in an attack, and the last to be withdrawn in retirement; however the construction of these rifles renders them unsuitable for long periods of continuous fire, and they should, therefore, be used in bursts rather than in protracted, uninterrupted fire. A typical example of fire by bursts is afforded by the fleeting opportunity of aerial combat.

The heavy type of machine rifle is the automatic machine rifle proper. While it can do most of the work of machine rifles of a light type, but with diminished celerity and greater effort, it has functions due to its stability and endurance which cannot be satisfactorily performed by any other type of rifle:

(a) To create one or more zones parallel to the general front of a defensive position which shall be so swept by fire as to be untenable by the enemy; (b) to guard the flanks of an attack against enfilade or envelopment by covering large areas near the flank and rear with fire; (c) long range covering fire; (d) night firing to sweep positions, the direction and range of which are determined by day; (e) indirect fire; (f) to provide sustained fire from defensive positions in fixed or semi-permanent works, an unlimited amount of ammunition being conveniently accessible.

There is known to the board at the present time no rifle, other than that cooled by water, which answers the requirements of the heavy type. The greater weight and strength and the reduction of heat with water give to the heavy type of machine rifles a reliability of function and endurance

which probably can never be attained by the lighter air-cooled type. On the other hand, the light rifles enable us to effect a great economy of infantry in the attack. A captured position can be quickly consolidated and can be held by a comparatively small number of men armed with light machine rifles. After a successful assault the bulk of the infantry can be quickly withdrawn to escape the destructive effect of the enemy's artillery fire with measured ranges. The respective spheres of usefulness of the two types thus seem to be clearly defined.

The board is of the opinion that in the equipment of the troops of the mobile army with machine rifles the proportion should be two of the light to one of the heavy type, the assignment being made as indicated in a table given in the report.

The board finds that the tests heretofore made show that the Vickers machine rifle fulfills to a high degree the requirements of the military service for a machine rifle of the heavy type. The board is not able at this time to recommend a machine rifle that will fulfill the requirements of the military for a machine rifle of the light type, but expects the results of the tests, hereafter recommended to be conducted by it, will enable such recommendation to be made.

The convening order directs the board to recommend the type of machine rifle which should be procured in case of an emergency requiring an earlier supply than can be had of the rifle eventually considered most suitable. Hereinafter the board recommends the immediate purchase of a certain number of Vickers machine rifles for the United States caliber .30 ammunition. Should a limited quantity of machine rifles be required before Vickers machine rifles can be obtained, the existing sources of supply of machine rifles in this country can promptly supply Lewis, Vickers and Colt rifles that do not use the U. S. caliber .30 ammunition. Should such a purchase become necessary, the board recommends the procurement of the required number of that one of the three rifles named that can be obtained promptly and most advantageously at the time; but should promptness of delivery be practically the same that preference be given to the different rifles in the order named. The lever action and the difficulty of reducing jams of the Colt machine rifle make it undesirable for use by troops in the field. The Chief of Ordnance has already purchased, to meet an emergency, 353 Lewis machine rifles that use the British .303 ammunition.

Further Tests.—Several machine rifles, some of which have not been previously submitted for test in this country, and some of which have not yet passed a satisfactory test with the United States caliber .30 ammunition have been brought to the attention of this board. The large use of machine rifles in the European war has stimulated inventors and suggested improvements in existing types.

The obtaining for our service of the very best types of machine rifles, particularly of the light type, is deemed of great importance. Information furnished by inventors and manufacturers shows that some will require about six months in which to prepare machine rifles in satisfactory condition for test.

The board, therefore, recommends that it conduct a further test of automatic machine rifles at the Springfield Armory, Springfield, Mass., the test to begin on May 1, 1917.—*Army and Navy Journal*, 11/11.

INCREASING CALIBER OF NAVAL GUNS.—The British Government contemplates mounting 18-inch guns on its newest super-dreadnoughts, at least one of these powerful weapons having been built under the direction of the ordnance experts of the Admiralty. Definite information to this effect has reached Washington and it has made a deep impression on navy officers here.

The fact that 18-inch guns may be adopted by the British Navy, considered in connection with the decision of the Navy Department to mount 16-inch guns on the four new battleships in this year's American naval

building program, accentuates the rapid strides that have been made in naval ordnance and gunnery during the last decade. It means that with better shooting among the world's principal navies, and longer battle ranges, it has become necessary to adopt bigger guns to effectively deal with dreadnoughts at the distance at which sea battles are fought to-day.

During the Spanish war 3000 yards was considered a good battle range. It was possible for the 13-inch guns of the *Kentucky* and *Kearsarge* to penetrate 12 inches of armor at that range. At 6000 yards these older model 13-inch guns—they were only 35 calibers in length as compared with guns of 50 calibers in use to-day—would penetrate only 9.7 inches and at 9000 yards only 8 inches.

The 12-inch guns on the dreadnought *Arkansas*, which are 50 calibers in length will send shells through 17.5 inches of armor at 3000 yards, 13.9 inches of armor at 6000 yards, and 11 inches of armor at 9000 yards. The first of the 14-inch guns of the American Navy were brought out in 1909 experimentally. They were only .45 calibers in length. They are capable of penetrating 18.7 inches of armor plate at 3000 yards, 15.4 inches at 6000 yards, and 12.6 inches at 9000 yards. The 14-inch guns now being built for our navy are 50 calibers in length, and more powerful, and will penetrate 12 inches of armor at 12,000 yards.

The decision of the British Admiralty to build 18-inch naval guns is understood to be the result of the two naval engagements of the prevailing European War which were fought at very long range. These were the battle off the Falkland Islands, and the Dogger Bank engagement in which the German battle cruiser *Blucher* was sunk. The range at which the Falkland Islands battle began was 17,000 yards, and the range at which the Dogger Bank battle was begun was 18,000 yards. In the latter battle the heaviest guns used by the British were 13.5-inch.

The fact that hits are possible at a range of 18,000 yards under battle conditions itself illustrates the advance that has been made in naval gunnery. It is this advance, this lengthening of the range at which war vessels may be hit in actual battle, that has forced the navies of the world to increase the power of their guns, for the very simple reason that if battles are to be fought at such long ranges more powerful weapons are necessary to deal the staggering blows necessary to disable an enemy.

The strides in gunnery have been remarkable since the Spanish War, and since then there has been a steady lengthening of the range at which ships and targets can be hit by American, British, and German warships.

"It matters little how good your shooting is at long ranges," said one ordnance expert to-night, "if the shot, when delivered at 18,000 yards or 20,000 yards, will not damage the ship of the enemy. In order to damage the ship it is necessary for the shot which strikes that vessel at such long range to penetrate the armor and explode with damaging effect inside of the ship or for the projectile to strike the deck of the ship. The longer the range, the deeper the angle of fall of a projectile on the deck of the enemy battleship, and the greater the angle of fall, the greater the chance of penetration. In the building of the high-powered gun for long-range shooting, the weapon must be made powerful enough to accomplish the double object either of penetrating the maximum thickness of the armor or of falling with steep enough angle on the deck of the ship, if the armor belting is missed, to penetrate the deck. The aim in modern naval battles at long ranges is not only to hit the enemy, but to put through the protective armor or through the deck of the enemy's vessel a shell sufficiently powerful to so damage the interior of that vessel as to disable it. If the 14-inch gun can do this at the range at which the battle is fought and will put the enemy's ship out of action, all well and good, but if the 14-inch gun will not do this at the longest battle range, and the 16-inch or 18-inch gun will, and the enemy is armed with the larger gun, the enemy has distinct advantage."

The possibilities of modern gunnery were exemplified several weeks ago in experimental target practice at Tangier Sound, in the Chesapeake Bay, when the big guns of the *Pennsylvania*, at a range of about 22,000 yards, scored five hits out of a single salvo of 12 guns. The *Pennsylvania* is armed with a primary battery of 12 14-inch guns.

American ordnance experts have said that the 14-inch guns on the *Pennsylvania* would shoot further, shoot straighter, and hit harder than any gun now in use or known to be designed by a foreign country. This assertion also was made by Secretary Daniels on April 30, 1915. With American ordnance experts and the general board of the navy there has been this axiom with regard to caliber: That a ship should mount the smallest big gun that will pierce the enemy's armor over vitals at the maximum probable fighting range.

It is estimated here that the 18-inch guns of the British Navy will each weigh about 150 to 160 tons, and that the weight of the projectile will be about 2900 pounds. The new 16-inch guns of the American Navy will throw projectiles weighing about 2100 pounds. The 15-inch gun carried by the *Queen Elizabeth* throws a shell weighing about 1920 pounds. Our 14-inch shell weighs 1400 pounds.—*New York Times.*

A NON-RECOIL GUN FOR AIRCRAFT.—To overcome the two factors that are the chief limitation of the power of armament for aircraft—the force of recoil and the weight of the gun—an American firm has brought to perfection, according to the *Scientific American*, a novel and ingenious type of gun. The new weapon is cast as two separate tubes, which are joined by an interrupted screw thread. The front barrel, chambered at the rear to receive the projectile, is rifled; the rear barrel is of uniform bore throughout and unrifled. Its function is to provide the necessary travel for the rear projectile. When unlocked it rotates in its mounting, slides to the rear clear of the front barrel, and swings to the right and down. These movements, effected by continuous pressure on a single handle, constitute a simple and easily operated breech opening machanism comparing favorably with that of the latest type of quick firing guns.

The cartridge case is of brass, in outward appearance quite like that of an ordinary piece of ammunition. The projectile occupies one end, the powder charge the mid-section, the recoil charge of fine lead shot the rear end. This charge with its wads is approximately equal in weight to the front projectile, the difference being due to the difference in frictional resistance between a solid body in a rifled bore and a more or less dispersed one in a smooth bore. Upon discharge it quickly breaks up and loses its velocity a few yards from the rear muzzle, and so is not a menace to anyone behind or below.

These guns, according to this authority, are of simple design and have proved reliable under all conditions of service. Several hundred of them, with great quantities of ammunition, have been completed and despatched to the allied nations. While those now under construction are 2-, 6- and 12-pounders, 4- and 5-inch guns have been built and tested with success, and the preponderance of small and medium caliber instruments is due entirely to the fact that they are more suitable to the current types of aeroplanes, and in no sense because they represent a limit of size beyond which if would be in any way disadvantageous or impossible to go.

The 2-pounder gun is 10 feet long and weighs 75 pounds. It shoots a 1.575 projectile with a muzzle velocity of 1200 feet per second. It may be fired from the shoulder with less inconvenience than the ordinary high power rifle. The 6-pounder weighs 130 pounds, the 12-pounder 210. The latter is of 3-inch bore, and attains a muzzle velocity of 1100 feet per second. These velocities, while apparently low, are in reality ample, because of the great increase in range due to the elevation. For example, the range of the 12-pounder, when fired horizontally from a height of 5000 feet, is 6000 yards, three times its effective range at the earth's surface.

"The practicability and effectiveness of this gun," we are told, "have been amply demonstrated in practice. Freed from the heavy pitching which the recoil of the ordinary gun produces, or from the excessive weight of the older types of recoil absorbers, an aeroplane equipped with it has a vastly increased freedom of action. It may fly higher and farther and faster, it may carry a greatly increased supply of ammunition, it may fire much more frequently and at the same time with equal or greater accuracy than ever before. And it is to be remembered that the use of this novel gun is by no means limited to aircraft. It will now be possible to mount artillery of relatively large caliber upon torpedo vessels and upon motor-boats and motor vehicles of every description. Indeed, so far as the science of making war has yet progressed, this gun represents the ideal type of ordnance for use on small units of any nature where extreme mobility and ease of transportation are the important considerations."—*Army and Navy Journal*, 3/11.

Frankford Arsenal Aerial Torpedo.—One of the men at the Frankford Arsenal in Philadelphia, is perfecting a new aerial torpedo. It has been tested by army fliers at the Mineola aerodrome, and may be adopted.

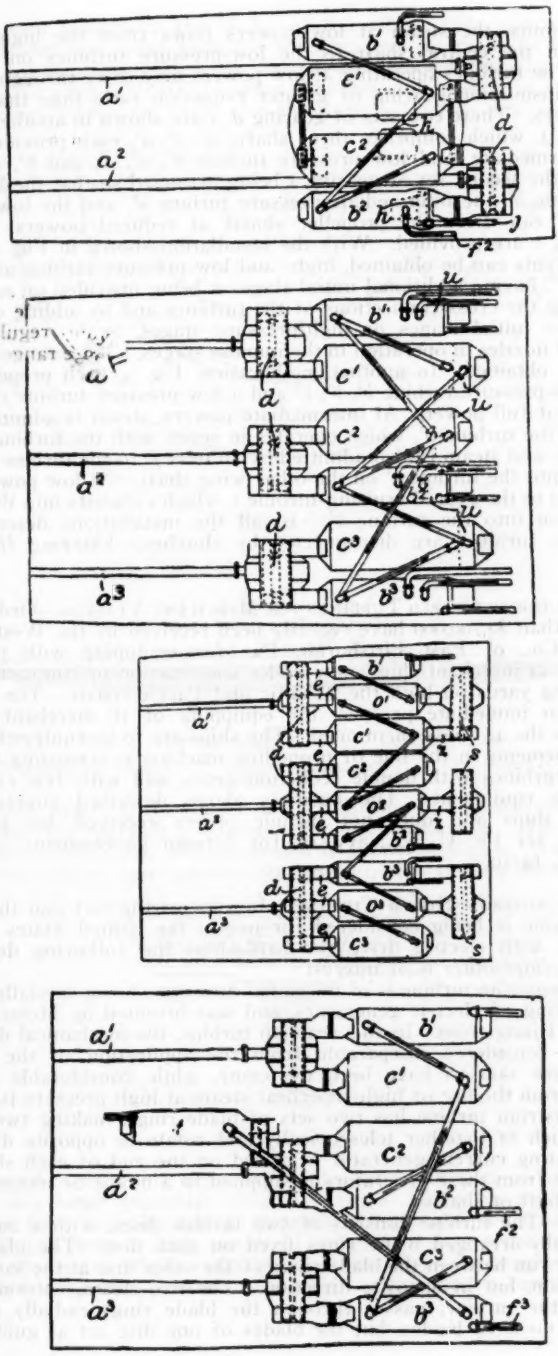
With the use of an electric time device, the aviator may control the time of explosion so that it will occur at a fixed distance from the ground, thereby scattering its charge of shrapnel. The tests have been so successful that a favorable report will be made to the War Department, recommending the adoption of the bomb.

The effectiveness of the new bomb is said to be greater than that of any such missile ever tried here or known in the European war zone.

The inventor has offered the exclusive use of his invention to the United States Government. The bomb is six feet long, is shaped like a torpedo, and carries, in addition to its poisonous gas charge, a heavy explosive charge.—*Aviation*, 1/11.

ENGINEERING

PARSONS' GEARED TURBINE DEVELOPMENT.—An important development in the mechanism of the geared turbine is indicated in the recent grant of a patent to Sir Charles A. Parsons, Mr. R. J. Walker, Mr. S. S. Cook, and Mr. L. M. Douglas, all connected with the Parsons turbine works, Newcastle-on-Tyne. It relates to geared turbine installations for ship propulsion having two or more propeller shafts provided each with a group of two or more distinct turbine units, and consists in obviating the occurrence of idle propellers at reduced powers, when one or more units in each group are rendered inoperative, by arranging for at least one unit in each group to be in operation at all powers. For regulating the pressure drops and outputs of the various turbines, certain stages may be by-passed; where impulse stages are employed, the number of nozzle jets may be regulated for the same purpose. Those turbine units which remain in operation at low powers may be provided with a second set of transmission gearing which is put in operation at low powers and has a greater reduction ratio than that of the full power gearing of the same units. Four installations are shown by way of example in the annexed diagrams reproduced from the *Shipping World* (London). In a two-shaft installation, Fig. 1, each shaft a^1, a^2 is driven at full power by a set of independent high and low pressure turbines b^1, c^1 and b^2, c^2 connected in a series and operating through gearing d. For low power, the units c^2, b^1 are inoperative and disconnected, and steam is admitted by a conduit f^2 to the high-pressure unit b^2 and then by a conduit k to the low-pressure turbine c^1 coupled to the other shaft. In some cases, at low powers, the steam is admitted by an inlet j to a cruising stage h in the high pressure units b^2. A separate cruising-turbine may be provided, driving through single or double reduction gearing. In another modification having a third propeller shaft provided also with high and low



FIGS. 1, 2, 3, 4—Methods of Regulating Driving and Transmission Mechanism of Parsons' Geared Turbines

pressure units, the steam at low powers flows from the high pressure turbine on the central shaft to the low-pressure turbines on the wing shafts. The turbines operating at low powers may drive through a second set of transmission gearing of greater reduction ratio than that used at high powers. These two sets of gearing *d*, *s* are shown in another installation, Fig. 3, which comprises three shafts a^1, a^2, a^3, each provided with a high, intermediate, and low pressure turbine b^1, o^1, c^1, and b^2, o^2, c^2 and b^3, o^3, c^3; the second set of gearing *s* being arranged so that the high-pressure turbine b^3, the intermediate-pressure turbine c^2, and the low-pressure turbine c^1 can drive the propeller shafts at reduced powers. Suitable clutches *e*, *z* are provided. With the installation shown in Fig. 2, several power outputs can be obtained, high- and low-pressure turbine units b^1, c^1, b^2, c^2, b^3, c^3, having additional initial stages *u* being provided on each shaft. By varying the cross connections of the turbines and by adding or cutting out certain initial stages or high-pressure stages, or by regulating the number of nozzles in operation in the impulse stages, a large range of power outputs is obtained. In another modification, Fig. 4, each propeller-shaft has a high-pressure turbine b^1, b^2, b^3 and a low-pressure turbine c^1, c^2, c^3 in operation at full power. At intermediate powers, steam is admitted by an inlet f^2 to the turbine b^2, which operates in series with the turbine c^2, as at full power, and steam is also admitted by an inlet f^3 to the turbine b^3, which exhausts into the turbine c^1 on the other wing shaft. At low power, steam is admitted to the geared cruising-turbine *t*, which exhausts into the turbine b^3 and then into the turbine c^1. In all the installations described, the inoperative turbines are disconnected by clutches.—*Shipping Illustrated*, 30/9.

WESTINGHOUSE GEARED TURBINES FOR MERCHANT VESSELS.—Orders totaling more than $2,700,000 have recently been received by the Westinghouse Machine Co., of East Pittsburgh, Pa., for equipping with propelling machinery 44 merchant ships, now under construction or contracted for at shipbuilding yards on both the Atlantic and Pacific coasts. The company also has in immediate prospect the equipping of 16 merchant ships in addition to the 44 above mentioned. The ships are to be equipped with the latest refinements in the line of propelling machinery, consisting of Westinghouse turbines with double reduction gears, and with few exceptions, condensing equipment. The business above described covers strictly merchant ships and does not include orders received for propelling machinery for the U. S. Navy, or for foreign governments.—*Shipping Illustrated*, 14/10.

THE LJUNGSTRÖM STEAM TURBINE.—In view of the fact that the Ljungström turbine is being considered for use in the United States Navy in connection with electric drive for battleships the following description from *The Shipbuilder* is of interest:

The Ljungström turbine is of the radial-flow type, being specially adapted to the driving of electric generators, and was invented by Messrs. Birger & Fredrik Ljungström. In this reaction turbine, the mechanical difficulties previously considered inseparable from the application of the reaction principle are said to have been overcome, while considerable economy resulting from the use of high-superheat steam at high pressure is claimed. The Ljungström turbine has two sets of blade rings, making two turbine wheels which fit together telescopically and rotate in opposite directions. An alternating current-generator is placed on the end of each shaft, and the current from these generators is supplied to a motor or motors on the propeller shaft or shafts.

Blading.—The turbine consists of two turbine discs, with a number of concentrically-arranged blade rings fixed on each disc. The blade rings of one disc run between the blade rings of the other disc at the same speed of revolution, but in opposite direction. The live steam, entering at the center of the turbine, passes through the blade rings radially outward. There are no fixed blades, but the blades of one disc act as guide blades

for the steam passing to the blades of the other. The relative velocity between blades and guide blades is twice as high as would be the case if one set were stationary, the work done in each blade ring being, therefore, four times as great. Hence it is seen that only one-quarter of the number of blade rings is required to develop the work ordinarily obtained from the steam.

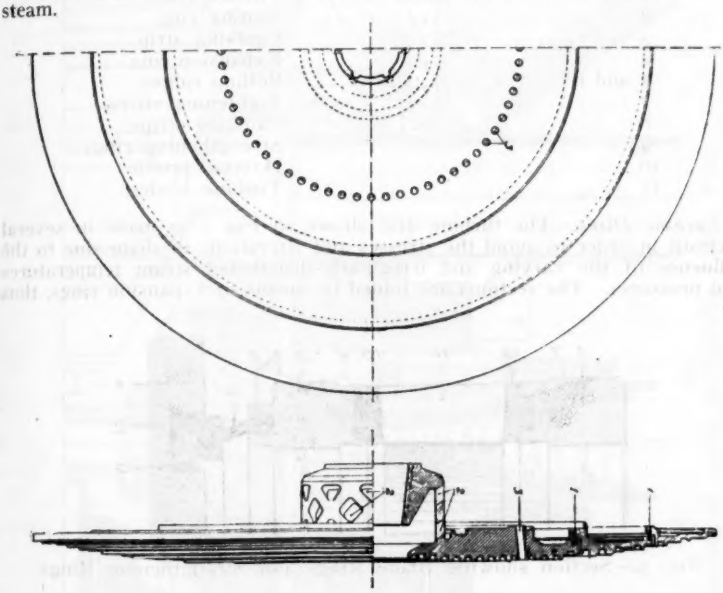


FIG. 1.—Cross-Section of a Turbine-disc
1. Expansion Rings. 2. Steam Entrance. 3. Overload Ports.

The steam enters at the center of each turbine disc inside of the innermost blade ring through a number of holes in the disc. The discs are practically identical, and a cross-section is shown in Fig. 1. As the steam increases in volume by expansion the length of the turbine blades must be

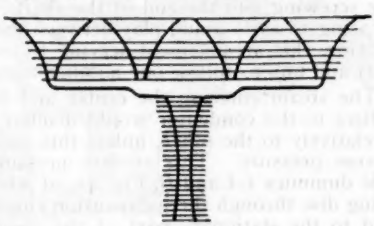


FIG. 2

proportioned to meet this increase. As, however, turbines of large powers require very large quantities of steam, single blades in the wide rings would not have sufficient tensile strength to withstand the stresses set up by centrifugal force at high speeds of rotation, and in order to meet this difficulty the widest blade rings in the Ljungström large-power turbines are divided into sections as shown in Fig. 2, the sections being connected

to strengthening rings attached to the outer edges of the blade rings. In, say, a 1000-k. w. turbine continuous full-length blades are adopted. The method of assembling the blades and rings is shown in Fig. 3, the numerals in this figure having the following significations:

1	Turbine disc.
2	Seating ring.
3	Caulking strip.
4	Expansion ring.
5 and 6	Rolling ridges.
7	Tightening strips.
8	Caulking strips.
9	Strengthening rings.
10	Dovetail profile.
11	Turbine blades.

Turbine Discs.—The turbine disc shown in Fig. 1 is made in several sections in order to avoid the stresses and alterations in shape due to the influence of the varying and irregularly-distributed steam temperatures and pressures. The sections are joined by means of expansion rings, thus

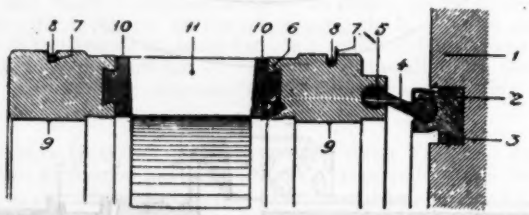


FIG. 3.—Section showing Blade Rings and Strengthening Rings

allowing for any expansion or contraction and preventing stresses from taking place in the material. In addition to the holes provided for admitting steam to the blades (2, Fig. 1), other holes are provided further away from the centre of the disc (3, Fig. 1) in order to allow full-pressure steam to be admitted to the blades which ordinarily use expanded steam. The center hole of the turbine disc is tapered, and the hub is secured to the shaft by means of a number of round keys, the latter being held in place by a locking device screwing into the end of the shaft. The shaft is made hollow inside the casing so as to avoid play between the hub and the shaft due to unequal heating, this arrangement serving to make the changes in temperature in shaft and hub to follow one another rapidly.

Axial Thrust.—The steam entering the center and flowing through the series of turbine discs to the condenser would displace each rotating half axially outwards relatively to the other, unless this was counteracted by a corresponding reverse pressure. This reverse pressure is effected by a series of labyrinthic dummies (*A* and *B*, Fig. 4), of which *A* is attached to its respective rotating disc through three expansion rings, and revolves with it, while *B* is fixed to the stationary part of the steam chest. Steam is admitted between these dummies from the center of the turbine. The inner labyrinthic packings receive the full steam pressure, which gradually decreases from the center until it finally drops to that of the condenser outside of the outermost labyrinth. Each rib of the fixed dummies has a small groove on its outer face, into which a folded strip of thin nickel is lightly driven.

These labyrinthic dummy packings form an accurate method of balancing the axial thrust. Should the load increase in the turbine, the revolving

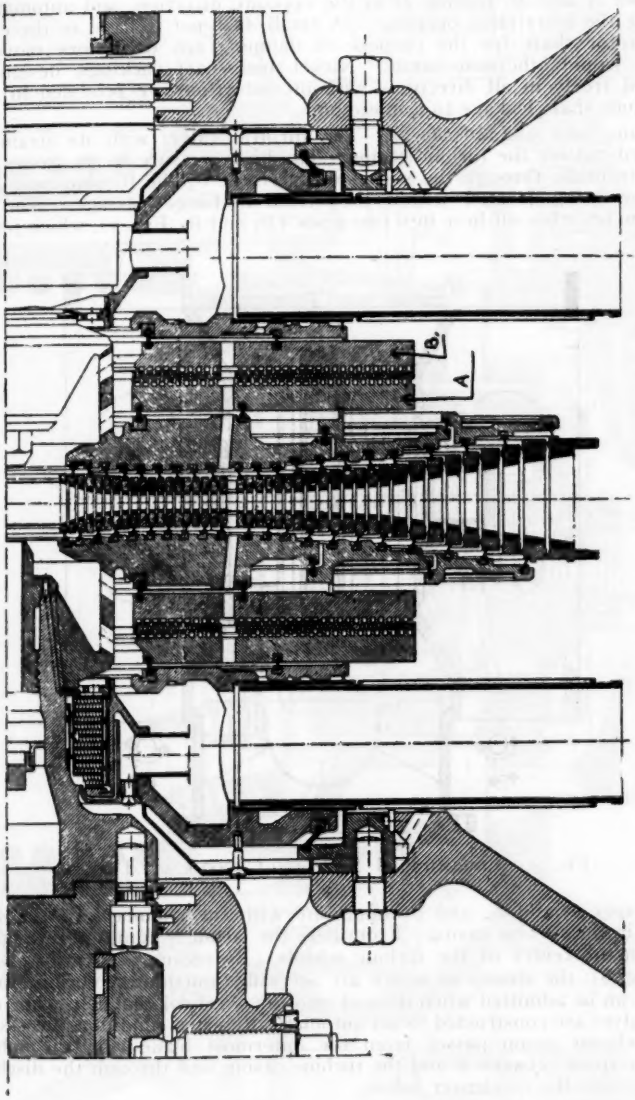


FIG. 4.—Longitudinal Section of 1000-k. w. Turbine, Lower Part

labyrinthic face A approaches the fixed face B, thereby increasing the space between the nickel strips, and causing high-pressure steam to enter between A and B, forcing D in the opposite direction, and automatically closing the labyrinthic openings. A small dash-pot is fixed to the end of each rotor shaft for the purpose of damping any oscillatory movement which would otherwise occur. Nickel-steel shaft packings, designed to expand freely in all directions without distortion, are provided in order to reduce shaft leakage to a minimum.

Steam Inlet and Discharge.—The throttle valve, with its strainer, is situated outside the turbine casing. The high-pressure steam passes from it horizontally through the steam-inlet passage of the turbine casing, this passage being located within the steam-discharge passage. The inlet passage branches off here into two pipes (B_1 and B_2, Fig. 5), which join the

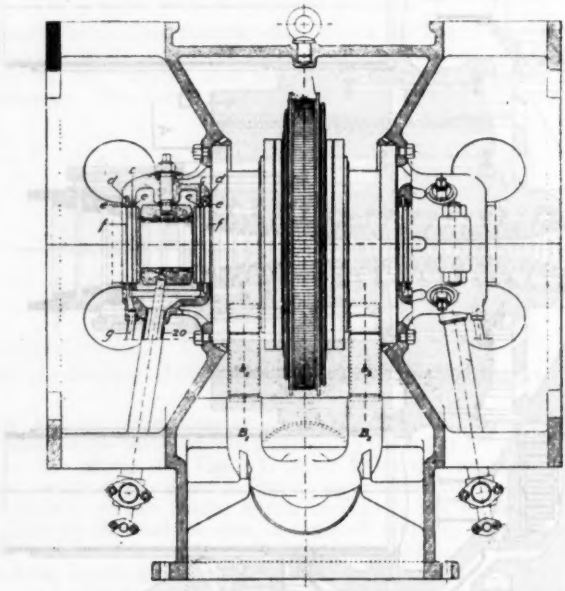


FIG. 5.—Longitudinal Section of 1000-k.w. Turbine

steel pipes b_1 and b_2, and communicate with the chambers of the steam chests in the turbine casing. From here the steam is admitted through the hubs to the center of the turbine wheels. By means of overload valves (x, Fig. 6), the steams of which are accessible outside the turbine casing, steam can be admitted when desired into the overload channels. The overload valves are constructed to act automatically when conditions necessitate. The exhaust steam passes from the outermost blade ring through the annular space between it and the turbine casing and through the discharge passage into the condenser below.

Heat Radiation Insulation.—Since the turbine is located in the exhaust passage and fitted with small cross-section area expansion rings, the conduction of heat from the hot high-pressure parts to the comparatively cool low-pressure parts and the casing is very slow, and the casing requires no lagging. The only parts which do need heat insulation are the throttle valve and strainer, the pipes carrying the high-pressure steam through the

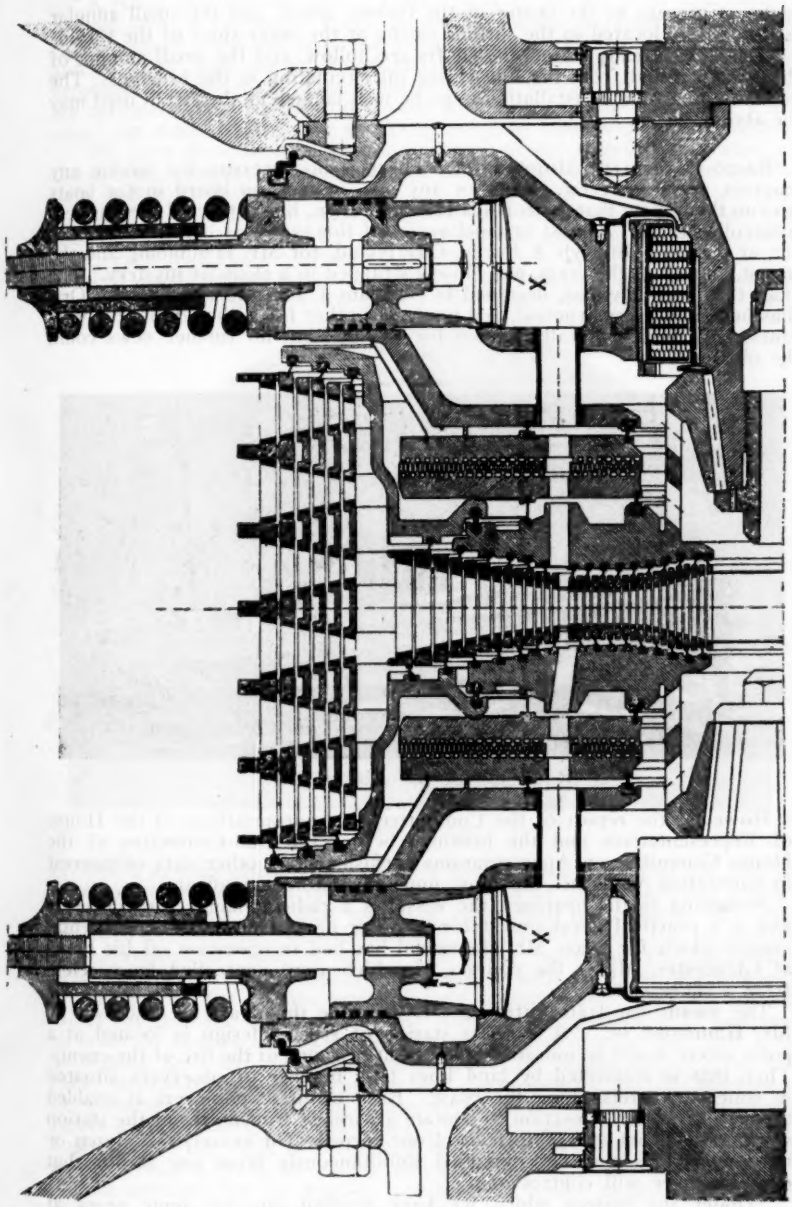
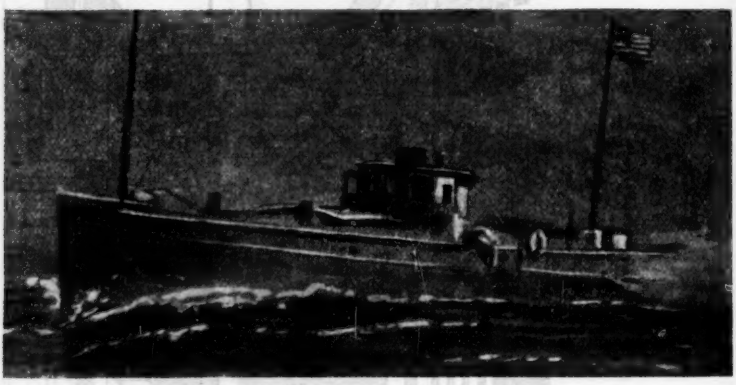


FIG. 6.—Longitudinal Section of 5000-k.w. Turbine, Upper Part

exhaust passage to the center of the turbine wheel, and the small annular steam chests located in the turbine casing at the outer sides of the turbine wheels. As already stated, the shafts are hollow, and the small amount of heat transmitted from the lubricating oil circulating in the bearings. The steam piping of the installation must be well lagged, as the steam used may be above 700° F.

RADIO CONTROLLED MOTOR BOAT.—There is no necessity for having any captain, engineer, crew, owner or any one, in fact, on board motor boats to run them, now that John Hays Hammond, Jr., has perfected the wireless controlled craft. A most unusual vessel of this type was launched October 12, at the yards of Kyle & Purdy, City Island, for Mr. Hammond, and the event, as well as the craft, was closely wrapped in a cloak of mystery. The fact that such a vessel, designed by William J. Gielow, of Gielow & Orr, has been under construction, and numerous other facts, though not the vital ones, have been generally known for months, but no further news could be obtained.



RADIO CONTROLLED MOTOR-BOAT

However, the report of the Committee on Appropriations of the House of Representatives and the hearings before the Sub-Committee of the House Committee on Appropriations furnish certain other data of interest in connection with this the most unusual motor-boat afloat.

According to the hearings, the vessel is a radio dynamic torpedo craft and is a practical development for army or navy use of the experimental vessels which for years Mr. Hammond has had in operation off his home at Gloucester, Mass., the courses of which were controlled by wireless from a shore station.

The means for transmitting power to drive this craft as described by Mr. Hammond is: "A wireless station of special design is located at a point where it will be indestructible or out of range of the fire of the enemy. Then that is connected by land lines to a number of observers situated in concrete turrets along the coast. Each of these observers is enabled through his wire connection to operate a wireless transmitter at the station so as to send out energy to control one torpedo (or vessel). A dozen or more torpedoes may be controlled simultaneously from one station, but each observer will control one.

"Under the system which we have worked out for some years at Gloucester the accuracy of control is such that we are enabled to strike a bamboo rod one inch in diameter, standing upright, 10 out of 15 times at a distance of three and one-half miles.

"A recent development which I have made to get the thing still further flexible and to overcome every argument against its limitations in the shore control is control from an aeroplane by wireless on the aeroplane, and we have now demonstrated satisfactorily that the power from the aeroplane is sufficient to control the apparatus up to one mile away from the aeroplane, but that is with a very weak transmitting outfit, and I am sure I can work that distance up to three or four miles without any trouble.

"We have demonstrated absolute control of the steering apparatus, of the driving, motors to start and stop the mechanism, and of the searchlight and to accelerate the speed.

"All that is necessary in steering one of these boats from shore is a telescope and a key, and you can go up along the shore in the woods or the underbrush and operate perfectly satisfactorily."

When questioned as to possible outside interference in the way of wireless energy coming from the enemy, Mr. Hammond replied: "I have

STERN VIEW OF THE "H-4"

evolved a system which, when there is interference present in the way of wireless energy coming from the enemy, will cause the torpedo (or vessel) to turn around and face that source of energy and move toward it. That has been demonstrated experimentally." The report from the Committee on Appropriations said, in part: "For many years past the desirability of having an offensive weapon in connection with sea coast fortifications in addition to the passive ones of land batteries and fixed or floating mines has been felt by all authorities. The officers of the War Department in order to acquire such a weapon have for more than a year past been witnessing tests of the inventions of John H. Hammond, Jr., for the radio control of dynamio torpedoes and the committee has felt warranted in recommending to Congress an appropriation for the acquirement of the rights of Mr. Hammond, conditioned, however, upon a satisfactory demonstration of the value of his system before a joint army and navy board, and provision is made for a sum sufficient to conduct such test."

That accounts for the warlike looking little vessel, launched at Kyle & Purdy's yard and given a trial under her own gasoline motor power the next day. She will proceed at once to Gloucester, Mass., where she will be equipped with her more intricate and secret mechanism and put through her paces prior to the official tests.

This new vessel which is painted in war gray, with *H-4, Gloucester*, on her transom, is 50 feet long, with a beam of 10 feet and a draft of less than three feet, while her main power plant consists of a 12-cylindered Van Blerck motor that develops 450 horse-power at 1400 r. p. m. She is built of 10 and 12 guage steel, has three water-tight bulkheads and a steel conning tower, with a steel trunk aft, over the maneuvering apparatus. She has two rudders and has clamps on both sides, at the bow, apparently to hold a torpedo.

In her trial it was evident that the motor was not turned up to more than 900 r. p. m., but at that she attained a speed of more than 25 miles an hour, creating such a wash as to give the impression of a miniature tidal wave.—*New York Herald*, 16/10.

NEW PROBLEMS OF MARINE ENGINEERING.—So many new problems face naval designers and marine engineers to-day that it is well to note with exactness the advances which have been made in mechanical efficiency, and the notorious shortcomings for which modern engineering is seeking a remedy. Even the scheme of standardized ships, upon which we commented recently, does not claim any advantage beyond that of economy in building a number of vessels of identical type, so that the engineer cannot expect from the reproduction of familiar experience implied in such a scheme any help in overcoming the problems of engine equipment, boiler designs, propeller eccentricities, skin resistance, fuel economy and so on. Let us see what is actually needed.

The engine room of any ship generates enough engineering questions to provide societies with ample material for discussion. From the voluminous discussions which have taken place, it is possible to ascertain the status of the Diesel engines, none of which, by the way, resemble the original productions of Diesel, the nominal inventor of them. The marine Diesel is bound to undergo changes before it becomes an all-round proposition, and it is to this that many engineers are devoting themselves at the present moment. The possibilities of application to war vessels can be stated briefly. Modern destroyers and light cruisers, as a rule, are propelled by means of high-speed turbines, supplied with steam by water-tube boilers of large power per unit and generally oil-fired. Speed being the great essential for such vessels, lightness and compactness of machinery are vital. Such steam-propelling machinery with auxiliaries will weigh from 27 pounds to 35 pounds per shaft horse-power. The lightest Diesel engines weigh (without the auxiliaries) about 56 pounds per b. h. p. and consume, say, about one-half pound of fuel per b. h. p., whereas steam turbine installations, with auxiliaries, weigh about half as much per s. h. p., the consumption of oil fuel being rather under one pound per b. h. p. The installations could be compared only if the weight of machinery, plus fuel for a given displacement, speed and radius of action were the same for each installation; and even if that were possible the advantage would rest with the steam machinery, owing to the more rapid lightening of the vessel due to the difference in fuel burnt and a corresponding increase of speed. Only when the power is comparatively small and the weight of fuel is considerably more than at present would it be possible to use Diesel engines in torpedo craft.

All that one can say about the Diesel for battleships and battle cruisers is that it is a possibility of the future. Big steamers are in the same category. On the other hand, excellent service is performed by Diesel engines in submarines, moderate sized steamers and a variety of other ocean-going craft, from which one may conclude that such engines are likely to undergo further adaptations. Undoubtedly they are regarded with disfavor by many engineers, but our purpose on this occasion is simply to record facts and not to concern ourselves with personal views. So many innovations in ship designing have occurred of late that the evolution of the Diesel appears to be merely a detail of the great changes

which are occurring in our supposedly conservative yards and shops. Have not monitors become transformed and strange designs appeared on the seas to warn us that we are still in an age of experiment? Some excellent work (not permissible to record in print) has been accomplished of late by naval architects and shipbuilders.

What is to be the outcome of the rival claims of steam turbines and reciprocating marine engines? So far competition has spelt greater efficiency, for makers of the reciprocating engine have set themselves afresh to find another margin of economy. The modern type of quadruple expansion engine, supplemented with auxiliaries, has led to an improvement in the construction of the reciprocating installation, and the remarkable saving of coal ascribed to some recent mechanical equipment of that kind throws light upon the hesitation of big shipping companies over the adoption of steam turbines. Considering the many attacks upon it the reciprocating engine displays surprising vitality. Superheated steam has become a factor in the case, no matter how far additional capital cost and upkeep can be urged against a saving of coal consumption. One is obliged to recognize that the adoption of the use of superheated steam is not progressing at the rate anticipated, but the scheme exists, it is used in many engine rooms, and its development in British and foreign engineering appears to be assured. We shall not go beyond that, for it is certain that one type of equipment cannot be expected everywhere because vessels, like views, are not the same everywhere. Different makers, different opinions. The best plant under one set of conditions may be only the second best if different circumstances have to be taken into account.

Evidently the combination system possesses merits which promise a long continuance of favor in many ship-building yards. This is a combination of reciprocating engines and turbines, with which some of the most recently built liners have been equipped. When a four-cylinder, triple-balanced reciprocating engine is worked in conjunction with a low-pressure turbine there are generally three lines of screw shafting, the two outer (port and starboard) being driven by reciprocating engines, and the center one by the low-pressure turbine, which is supplied with the steam exhausted from the reciprocating engines. The advantage claimed for this system is that the same efficiency can be maintained over a wide range of power.

What improvements have resulted from experience in this arrangement? One can answer that question by pointing to certain undoubted improvements in detail by which the best efficiencies have been obtained from the reciprocating and turbine portions of the combined sets and the improvements made in the arrangements of the propellers have also had an influence upon the over-all efficiency. It has been suggested that the use of superheated steam for the high-pressure cylinders and geared exhaust turbines might further increase the economy of this method of propulsion, which many regard as likely to ensure a fresh lease of life for large passenger ships built for moderate speed.

Considering the strong efforts which have been made to develop the older types of propelling machinery, the marine steam turbine has made really good progress. That is evident from its adoption for naval use by every one of the great Powers. The limitations of the direct-driven steam turbine need no recapitulation here, because they are familiar to marine engineers. The main point is that there are conflicting requirements in the conditions by which the highest efficiencies of the turbines and of the propellers can be obtained. As a matter of fact, a sort of compromise system is in vogue in direct-driven marine turbines. A deal of difficulty has been overcome by the use of gearing in order to unite the advantages of the fast-running turbine with the power of slow-running propellers. No matter how strongly controversy may rage round incidental questions there can be no doubt that the geared turbine constitutes a valuable development of its kind. The extreme accuracy now prevailing in the cutting of helical gears is doing much to extend this system of gearing among shipbuilders.

The question of noise relating to the gearing is not as formidable as some people anticipated. Consequently there is less of an experimental character about such gearing than there is in a number of other mechanical features of marine engineering. At the same time it would be idle to suppose that we are near the end of the developments. The whole question of engine power is of an unsettled character, so much so that the scheme of using producer gas plant on shipboard has been mooted in a rather elementary form. From an engineering point of view, we should say that the use of such plant, under the conditions suggested, would not be possible, and there is no disposition among shipbuilders to take the matter up seriously. There is something more tangible in the turbo-electric drive, but even in that we have not emerged altogether from the period of trial tests. In saying that we are not forgetful of successful results achieved in a number of instances by the use of such a drive. In this connection one need not refer at any length to the results credited to the Ljungström turbo-electric system, for this matter is already fresh in the minds of engineers. The Ljungström principle is applied to double rotation radial flow turbines, and in experimental installations the system is said to have demonstrated its suitability for marine service. A comparison is made in order to show that it represents a low steam consumption in comparison with other forms, and there is also the point as to adaptability for employment of high superheat, there can be no doubt that no matter what preference may be shown in the generation of power for the main machinery, there is a strong disposition to utilize electric driving for the auxiliaries, chiefly on the score of convenience and economy. This circumstance, in itself, is a significant reminder of the still unsettled aspect of power generation on ships, and one may legitimately regard the use of electricity on ships as a form of evolution from which marine engineering is likely to derive many new uses.—*Page's Engineering Weekly* (London), 8/9.

THE DYNAMIC BALANCE OF MACHINES.—A body at rest produces no external dynamic effect. If mounted on a shaft and rotated, each elemental or narrow cross-section of the body in a plane perpendicular to the axis of the shaft tends to revolve about a right axis passing through its center of gravity; and if the centers of gravity of all the sections lie in the axis of the shaft, this tendency is initially satisfied and no effort or force is required to exercise it, and each section, and therefore the body as a whole, is in running, or dynamic balance—the vector sum of the forces produced in each section by the rotation is zero, and thus no external effect results; the body runs quietly regardless of the speed.

If, on the contrary, the centers of gravity of some of the cross-sections, and therefore the axis about which they tend to revolve, do not lie in the axis of the shaft (which we will assume to be practically rigid, as is generally the case) these sections, and therefrom the body as a whole, are dynamically out of balance. The vector sum of the forces in all the sections will no longer be zero, but surplus or unbalanced forces will exist, which may produce undesirable external effects, appearing most commonly in the form of annoying or harmful vibrations, depending upon the masses involved, the speed and the environments, and sometimes further resulting in excessive twisting and bending stresses in the shaft, and undue journal friction, heating and wear.

Since it is only necessary that the centers of gravity of the cross-sections lie in the axis of the shaft in order for them to be in dynamic balance, this result can be accomplished with practical accuracy, in the majority of cases of machine design, and thus for the body as a whole, by the method of standing, or static balancing, when the construction permits the separate balancing of a sufficient number of sections, or parts, in this manner before they are finally assembled, and particularly such parts as methods of manufacture compelled by commercial exigencies may render liable to be out of balance in their finished state. For example, it may be advisable

to balance the commutator and armature of an electric motor separately in this way. Furthermore, the gear-wheel or pulley on the shaft, constituting a part of the whole revolving body, should also be in balance, as in fact, it is supposed to be, when received from the maker.

Again, the size and operating speed may make it desirable to balance parts of the armature and commutator bodies before they are assembled and the coils and bars are applied—it is easy for the designer to picture a structure that will be in perfect balance, as far as the drawings are concerned, but they do not take into account the effect of variations in density of the metal, especially in castings, the presence of blowholes, deformation by irregular shrinkage, etc., which may make balancing necessary by application of metal pieces at proper places to compensate for the defects mentioned, or the cutting off or boring out of metal for the same purpose.

In static balancing the axis of the piece may be centered on a temporary shaft set horizontally on level straight edges, and weight so added, or taken away that the piece remains stationary in any position in which it is rolled along the edges, which indicates that the center of gravity lies in the axis, and thus that the piece is balanced. Or for greater refinement for higher operating speeds an apparatus may be employed in which the axis of the piece, say, a single steam-turbine disk, is vertically centered over a straight line joining and representing the prolongation of two knife-edges of a horizontal rocking table on which the disk is supported. Balance is indicated, when the rocking table remains horizontal for any position of the disk about its axis.

But there are practical limits to the application of the static method of balancing for running operation, however refined. The body may not be separable into sections along the shaft for individual balancing, and therefore must be balanced as a whole. It may be a single casting with two sets of radial spider-arms wide apart in axial direction for support of other parts, say, the laminated steel core and coils of an armature; and even should the casting happen to be in practical balance for good running, the laminated core and coils, when applied, may destroy the balance.

The body, either the casting or the completed armature, can be statistically balanced as a whole, it is true, or so that the center of gravity of the whole mass lies in the axis of the shaft, by adding or subtracting weight at points suitably located circumferentially, although placed anywhere axially. But suppose a set of spider-arms at one end of the body thus balanced, considered by itself as a section thereof, does not have its center of gravity in the axis of the shaft, it will then be dynamically out of balance, and naturally so will be the whole armature; and the condition will be worse if the other set of spider-arms is also out of balance, and especially if its center of gravity is on the opposite side of the axis. In such a case the method of dynamic balancing is resorted to, when feasible of application.

Without dwelling on details of the apparatus employed, of which there are variations in design, it is sufficient to state in general that the body is rotated at operating speed with the shaft and bearings spring-held so as to permit a slight oscillation produced by the out-of-balance condition. The shaft is chalked or leaded, and by gradually advancing a metal stylus until it delicately touches the shaft at the high point of the oscillation a corresponding mark is made, which indicates the location where the weight should be changed. The weight is altered and the test repeated until balance is obtained for that end, when the stylus mark will encircle the shaft. The other end is then balanced in the same way, which completes the balance of the body as a whole in respect to the journals in which the shaft is held.

This is the best that can be accomplished practically, when the body as a whole has to be dynamically balanced; and it will run quietly, if the construction, and especially the shaft, is stiff enough to stand with undue strain the stresses that may be set up by out-of-balance sections. If the construction is weak, however, a good dynamic balance need not be

expected; the strains produced by out-of-balance sections may set up incurable oscillations, which may manifest themselves in extended vibrations, and noises varying from a disagreeable rumble to a clashing roar, not to mention hot and cut bearings, and possible crystallizing of material and breakdown. Naturally, we do not here include the possible clatter and singing of laminations in some types of electric machines, and windage, which likewise may amount to a roar in a large machine, as they do not relate to the subject of balancing.

Then there is the case of small high-speed machines, say, small motors, where the cost factor practically prevents close attention to balance until the armature is completed, and thus dynamic balancing, if any balancing is required, must be resorted to.

Finally, we have rotating machine constructions so large and massive that they do not practically lend themselves to more than an approximate balancing by the static method, and for the dynamic balancing of which it is not commercially practicable to install a special apparatus of the general character heretofore indicated, because it would have to be of comparatively huge dimensions, would be very costly and would not be used enough to warrant the outlay. In this case such balancing as is practicable is accomplished under running conditions by shifting weights by the cut-and-dry method, the effort being to minimize vibrations in the machine, its foundations and surroundings, and bearing friction, until good continuously-running conditions are obtained.

We have heretofore specifically dealt only with rotary bodies, but may include broadly among the machines that have to be balanced, when necessary, by cut-and-dry method those having connected rotating and oscillating and reciprocating members, for example, the crank, pitman, piston-rod and piston of a reciprocating steam engine. Here balancing is a complicated compromise between purposely produced surplus dynamic effects of out-of-balance rotation of one body and the dynamic effects of other connected non-rotating, but moving bodies, taken in connection with suitably adjusted energy transference from the bodies to the steam by compression of the latter. The balance at best is a rough one compared with that obtainable for a rotary body alone; in practice it is attained by careful attention to original design, as far as possible, and improved, if found essential, by redistribution of weight in one or more of the moving parts of the completed machine, or change in the steam compression by proper valve adjustment, or both.

Time was, when rotative speeds, taken in connection with the masses involved, represented dynamic effects much less in amount than we find common to-day. The ever-growing urgency that machines shall attain the highest practicable efficiency calls for speeding-up rotating elements—in electrical machines, for instance, the copper and accompanying iron must travel as fast as possible, in this almost over-fast era, and sometimes the materials are, in fact, made to travel too fast, and out-of-balance manifests itself, which would not have been the case had not the chase for exceeding efficiency resulted in the exaggeration of dynamic effects not before of noticeable or serious amount; hence the necessity for still better balancing.

Naturally, a physically perfect balance is not attainable; therefore a good-enough balance is the result to be sought, which leads us to the point that a balance good enough for a certain environment may be a bad out-of-balance in other surroundings—a machine that runs quietly on a floor, or even less massive support, as far as our senses are affected thereby, may kick up unendurable antics by way of vibrations and noises, if placed on some frail support, say, a shelf fixed to a thin partition; and a large high-power machine that seems as docile as a kitten when on a massive monolith of concrete, may act like a roaring lion, if set up on a steel structure, built however strong within reason, threatening destruction to everything around.—*General Electric Review* (reprinted from *Scientific American*).

SUBMARINES

THE "DEUTSCHLAND'S" SECOND TRIP.—The German merchant submarine *Deutschland* docked at New London, on November 2, with a cargo of dyestuffs, drugs and gems. The *New York Herald* has published several interviews with Captain Koenig, the master of the *Deutschland*, who says that he left Bremerhaven on October 10, and had a very stormy crossing. He denies the many reports from British sources that the *Bremen* has been captured, but admits the loss of the vessel, saying "the *Bremen* must be at the bottom of the ocean. She must have met with an accident of some sort."

SUBMARINE ACCIDENTALLY LOST.—The Danish submarine *Dykkeren* was sunk off Copenhagen, on October 10, in collision with a Norwegian merchantman. The submarine was raised and five of the six members of the crew that went down with it were rescued alive. The commander was found dead in the conning tower. The *Dykkeren*, according to *Brassey's Annual*, is a 103-130 ton submersible, built by F. I. A. T. in 1909.

TWO YEARS OF SUBMARINE WARFARE.—It is very easy to be wise after the event. That was recently brought home to us when, on reviewing the work done by submarines in the present war, we came across Admiral Sir Percy Scott's letter addressed to *The Times*, dated exactly two years before the battle of Jutland took place. On May 31, 1914, this officer, who has held many important commands afloat and ashore with distinction, when asked whether this country should continue building large or small battleships, replied: "My opinion is that we should be building neither," and he explained his reasons at length in a letter full of detail as to the functions of vessels of war, and the risks they ran from submarines, especially when the latter were acting in concert with aeroplanes. The letter received, as it demanded, a considerable amount of attention and criticism at the time, and it is interesting, in the light of the last two years' experience, to note Sir Percy Scott's final sentence in a statement replete with interest. "In my opinion," he wrote, "as the motor vehicle has driven the horse from the road, so has the submarine driven the battleship from the sea." This sentence must not be taken too literally, and if Sir Percy was perhaps guilty of exaggeration in detail, in his broad view the importance he then attached to submarines may reasonably be held to be partially justified by subsequent events. Had the Germans during the first two years of war used their submarines in their proper rôle instead of making the grievous error of using them on a species of *guerre de course*, it is probable that his views would have been far more closely corroborated, and, at any rate, we should have sustained far more serious losses than we actually have done. But much of what was said in his letter has actually come to pass, and if there do appear to be mistaken views on certain points, comments based on "wisdom after the event" must not be taken as hostile criticism.

Sir Percy Scott, after expressing the opinion that the introduction of vessels that swim under the water had entirely done away with the utility of vessels that swim on the top of the water, went on to postulate that the functions of a vessel of war were:

Defensively,

1. To attack ships that come to bombard our ports.
2. To attack ships that come to blockade us.
3. To attack ships convoying a landing party.
4. To attack the enemy's fleet.
5. To attack ships interfering with our commerce.

Offensively,

1. To bombard an enemy's ports.
2. To blockade an enemy.
3. To convoy a landing party.
4. To attack the enemy's fleet.
5. To attack the enemy's commerce.

One, two and three are now held to be rendered impossible, as no man-of-war would dare to come within sight of a coast adequately protected by submarines; and therefore the functions of a battleship as regards these items, both defensively and offensively, have disappeared.

Now, no one can reasonably deny that, as far as the present war has been conducted, items four and five, which are by far the most important in the list, have been successfully accomplished by our big ships, and in a manner quite beyond the scope of the most powerful submarine contemplated, let alone constructed, at the present time. The enemy's surface fleet being in existence, it behooved us, before the war, to take such steps as were compatible with this accomplishment. Sir Percy Scott's view that the fourth function was a non-existent possibility, owing to the danger from submarines preventing a fleet from putting to sea, has been entirely disproved. The fifth function, the attack on our commerce, has, in point of fact, been carried out to a greater extent by submarines than by surface ships, but we will return later to this point.

Our fleet has naturally acted on the offensive, and we will take the various sections as defined by Sir Percy as they occur in his list. The bombardment of the enemy's ports (1), is impossible for us in home waters, on geographical grounds, but it is also unnecessary on account of the strategical fact that we can contain the enemy's fleet, *i. e.*, blockade him (2), without approaching either his ports or his fleet, by simply establishing a control between the Shetland Islands and the Norwegian coast, and by holding the Straits of Dover, thus enclosing the whole North Sea. Our submarine flotillas, in August, 1914, promptly established a coastwise observation patrol off the German coast, but would have been powerless to enforce a blockade, as has been amply proved both in the North Sea and the Baltic. Section (3), to attack or convoy a landing party, has a great bearing on the present war, and the use of submarines. Although gigantic quantities of men and stores have been dispatched across the Channel to France in the last two years, not one of the transports engaged in this work has been damaged by submarine attack, while the convoy has consisted almost entirely of torpedo-boat destroyers, or at any rate of surface vessels. In fact, very few vessels engaged in the cross-Channel traffic have been sunk—the French refugee ship *Amiral Ganteaume*, the British hospital ship *Anglia* and the Channel steamer *Sussex*, being the most important. Attempts, of course, have frequently been made on our ships, including one unsuccessful attack on the large hospital ship *Asturias*. It would appear that either our surface patrol, not necessarily in the immediate vicinity of the transport route, or of the ports of departure and arrival, but protecting the Channel generally, suffices to moderate the danger, in conjunction with the fact that so many of the sailings are, for the sake of greater safety, made at night, or that adequate importance was not attached by the German submarine commanders to the value of attacking military rather than mercantile vessels. Had the German submarines concentrated greater attention on attacking the transports belonging to the expeditionary force in the earlier stages of the war, it cannot be doubted that the damage would have been of a very serious nature, but it would have been quite impossible for them to do more than hamper the landing; they certainly could not have prevented it, though successful attacks in the early stages would undoubtedly have had a considerable influence on the operations at that time. On only one occasion have the German submarines scored a big success against a large British transport, the instance being the sinking of the *Royal Edward* in the Mediterranean in August last year. Russian and English submarines working together in the Baltic, however, materially hampered the operations of the German transports which, under cover of the German fleet, attempted to land troops in the neighborhood of Riga during the autumn campaign of 1915.

The attack of the enemy's fleet—section (4) of Sir Percy Scott's letter—has, as he foretold, been largely restricted by the fact that both battleship fleets have remained much in port, especially the German fleet. During

the first week of the war, *U-15* attempted an attack on the grand fleet at sea, and was promptly rammed, on coming to the surface to see the result, by H. M. S. *Birmingham*. This was the first proper encounter in the submarine warfare during the present war. Isolated instances occurred during September, 1914, H. M. S. *Pathfinder* being sunk by *U-21*, and the German cruiser *Hela* by *E-9*. On September 22d H. M. ships *Cressy*, *Hogue*, and *Aboukir* were sunk while patrolling in the North Sea by *U-9*. The losses of H. M. S. *Hawke*, *Hermes*, and *Niger* were followed, on January 1, 1915, by the torpedoing of H. M. battleship *Formidable* in the Channel. This attack is remarkable for having been made at night and in rough weather. It was not until January 24, 1915, towards the close of the battle-cruiser action in the North Sea, that submarines were observed by our fleet attempting an attack, which failed. A further attack on a division of the grand fleet at sea was made by *U-29* in March, and resulted in her total loss with all hands. In the attacks in the Dardanelles in May we lost two old battleships from submarine attack—the *Triumph* and the *Majestic*. After this there was for some time a period of comparative immunity for our larger vessels, and there were none of the attacks that an enemy who intended vigorously to prosecute a war of attrition might have been expected to undertake. Efforts continued to be directed against our commerce rather than against our main fleets. The same applies to the fleets of our Allies. The French have only lost two old cruisers, the *Leon Gambetta* and *Amiral Charner*, and one destroyer, *Renaudin*, by submarine attack; the Russians lost the cruiser *Pallada* in the Baltic, and a destroyer in the Black Sea; the Japanese have lost nothing, while the Italians have had the cruisers *Amalfi* and *Guiseppe Garibaldi* torpedoed in the Adriatic. They also lost the submarine *Medusa*, which was torpedoed in a duel with an Austrian submarine, this being an exceptional incident of its kind. It will be observed that none of these vessels can be considered as modern ships. When it is realized that from Archangel in the north to Alexandria in the south is a distance of over 5000 miles, and that the whole of this route has to be patrolled by the British Navy, aided, as far as the Mediterranean goes, by the French Navy, it will be seen that the losses of the fleet from submarine attack have been very small, particularly in view of the submarine's opportunities. In the course of the last 12 months, owing to the destruction and capture of enemy submarines by all sorts of methods, attacks on warships have been much less frequent. Submarines played no particular part in the battle of Jutland. One certainly inflicted considerable damage on H. M. S. *Marlborough*, and was sunk for her pains, and this is the only occasion on which a British dreadnought type of battleship has been torpedoed. It seems hardly necessary to remark that the *Marlborough* has long since been repaired. H. M. cruisers *Nottingham* and *Falmouth* were torpedoed off the German coast last August, this being practically the only instance of successful defensive attack by enemy submarines, in spite of the ample opportunities offered. While the foregoing list practically covers the successful attacks on naval vessels, it must be remembered that a considerable number have been attempted without result, and that in more than one case ships have actually been hit without the torpedo exploding.

Section 5—to attack the enemy's commerce or ships interfering with our own—introduces one of the, if not the most, vexed maritime problems of the war. The German methods of attack on merchant vessels of all sizes, from the *Lusitania* to a rescuing trawler's dingy, have been truly atrocious in their wanton disregard of the rights of non-combatants or neutrals. Few greater mistakes could have been made than that which Germany committed when the war upon commerce was initiated, for it was intrinsically, as it was conducted, more than that, in so much as it violated agreements which were just as much—or less as Germany proved—binding as the Belgian neutrality agreement. Finding that after six months of war all its warship fleet had been swept off the high seas, and the large balance confined to intimate home establishments, and that the mines it had

laid so indiscriminately and without regard to neutral danger, had failed in their object of reducing the strength of the British fleet, which simply swept them up by thousands, the German Admiralty was driven to the desperate expedient of declaring a submarine war against hostile merchant vessels from February 18, 1915, the announcement being made on February 10. Within four weeks at least three German submarines were destroyed while thus engaged. The German warfare against commerce, besides being a political and strategical error of the first magnitude, eventually became a failure of the most pronounced type. To such an extent was neutral opinion raised that, as Mr. Balfour described this form of warfare, what were merely crimes at the commencement became manifest blunders later on. This, perhaps, represents only the political view. From the strategical or military view these insensate attacks have absolutely failed in their purpose. Certainly they have resulted in sinking perhaps about one and a half million tons of shipping, and thereby have assisted to increase the cost of freight. On the other hand, by concentrating their efforts on attacks on merchant vessels the Germans have neglected the main issue—the attrition of the battle fleet—to a fatal extent. It is too late now to remedy what is, perhaps, the greatest mistake of the naval side of the war. But in doing what they did the German submarine flotillas laid themselves open to attack and destruction in detail, and suffered to an extent which must surely be appreciated by themselves by this time.

Now let us look at the other side of the picture. Certainly we lost two out of a large number of battleships bombarding the entrance to the Dardanelles, but only two, and in this case submarines entirely failed to prevent bombardment, though it is admittedly the case that great caution was exercised over the movements of our later vessels in those waters. On the other hand, the presence of mine fields, and an excellent system of protection to the Dardanelles channel, did not prevent our submarines from passing through into the Sea of Marmora, and arriving off Constantinople itself. In the course of many trips of this nature made by boats of the *E* class, two Turkish battleships were sunk, as well as a large number of transports and supply ships. These submarines went even further, for they actually landed demolition parties, and on one occasion, it is reported, even entered into a minor engagement with Turkish cavalry on the beach! Nothing so enterprising has been undertaken by the other side. The fact is that our submarine flotilla in the Dardanelles materially hampered the communications and supply arrangements of the Turkish army in Gallipoli. Had the British commanders not been bound by their rigid observance of the rules of war as applying to the bombardment of unfortified towns they might—they were there and able to do so—have fired on the civilian populace and private property in Constantinople, just as a belated German submarine actually did arrive one dull morning off the Cumberland coast and fire a few rounds at Whitehaven!

The first engagement of the war—off Heligoland—saw the first serious employment of submarines on our side beyond scouting duties. In this case two of the boats were deliberately used as bait, one pretending to be broken down, and the other coming to its rescue, and very successfully was it done. The fact that the Germans lay so far in behind their extensive mine fields, coupled with the chronic low visibility in that particular corner of the North Sea, prevented anything more than an occasional "bag" being made during the early part of the war. Simultaneously, however, with the opening of the Dardanelles offensive, several of our submarines proceeded to the Baltic, and before the ice set in towards the end of 1915 had already made their mark on German naval movements in that part of the world. One of the *Deutschland* class battleships—said to be the *Pommern*—was sunk, and the *Moltke*, an armored cruiser of 27,000 tons, was very seriously damaged while supporting the naval attack on Riga in August, 1915. Since then several smaller German warships have been submarined in the Baltic, and a large number of merchant vessels carrying contraband to Germany from Swedish ports have been effectually prevented from arriving at their

destination without going to the extremes of torpedoing them without inquiry. Even so, however, with these successes submarines failed to prevent, though they materially hampered, Germany's naval movement in support of the left wing of her army. They failed to prevent entirely the importation of contraband into Germany, as far as the Baltic was concerned. Lack of numbers may have accounted for some of the failure, but the real truth lies in the inherent weakness of the submarine as a fighting vessel. Even its more recent history does not enhance its value. True, an *E*-class boat got two torpedoes home on the *Westfalen* in August, as she was being escorted back to port by destroyers, but it is still uncertain as to whether the enemy was sunk or merely badly damaged. The voyage of the *Deutschland* to New York was purely spectacular, though she may have carried some valuable documents, and thus achieved her purpose. In any case, it is understood that she was escorted out by neutral steamers, and the voyage itself is nothing; it has been accomplished by several of our own boats built in Canada, but is more than the *Deutschland's* sister ship the *Bremen* appears to have been able to do up to date.—*The Engineer*, 20/10.

AERONAUTICS

The United States National Advisory Committee for Aeronautics has issued its report on nomenclature for aeronautics which is here reproduced in full.

INTRODUCTION

For the information of those interested in aeronautics the following nomenclature has been prepared as a guide, with a view to eliminating the duplication of terms, the erroneous use of terms, and confusion of terms, and with a view to defining the principal terms which have come into use in the development of aeronautics. In the preparation of this nomenclature only those terms have been defined which are new and peculiar to this subject.

AERONAUTICAL NOMENCLATURE

AEROFOIL: A thin wing-like structure, flat or curved, designed to obtain reaction upon its surfaces from the air through which it moves.

AEROPLANE: See airplane.

AILERON: A movable auxiliary surface used for the control of rolling motion—*i. e.*, rotation about the fore and aft axis.

AIRCRAFT: Any form of craft designed for the navigation of the air—airplanes, balloons, dirigibles, helicopters, kites, kite-balloons, ornithopters, gliders, etc.

AIRPLANE: A form of aircraft heavier than air which has wing surfaces for sustentation, with stabilizing surfaces, rudders for steering, and power plant for propulsion through the air. The landing gear may be suited for either land or water use.

Pusher.—A type of airplane with the propeller or propellers in rear of the wings.

Tractor.—A type of airplane with the propeller or propellers in front of the wings.

AIR-SPEED METER: An instrument designed to measure the velocity of an aircraft with reference to the air through which it is moving.

ALTIMETER: An instrument mounted on an aircraft to continuously indicate its height above the surface of the earth.

ANEMOMETER: An instrument for measuring the velocity of the wind or air currents with reference to the earth or some fixed body.

ANGLE:

Of attack.—The angle between the direction of the relative wind and the chord of an aerofoil, or the fore and aft axis of a body.

Critical.—The angle of attack at which the lift is a maximum.

Gliding.—The angle the flight path makes with the horizontal when flying in still air under the influence of gravity alone.

ASPECT RATIO: The ratio of speed to chord of an aerofoil.

AXES OF AN AIRCRAFT: Three fixed lines of reference; usually centroidal and mutually rectangular.

The principal longitudinal axis in the plane of symmetry, usually parallel to the axis of the propeller, is called the fore and aft axis (or longitudinal axis); the axis perpendicular to this in the plane of symmetry is called the vertical axis; and the third axis, perpendicular to the other two, is called the athwartship axis (or transverse or lateral axis). In mathematical discussions the first of these axes is called the X axis, the second the Z axis, and the third the Y axis.

BALLONET: A small balloon within the interior of a balloon or dirigible for the purpose of controlling the ascent or descent, and for maintaining pressure on the outer envelope to prevent deformation. The ballonet is kept inflated with air at the required pressure, under the control of a blower and valves.

BALLOON: A form of aircraft comprising a gas bag and a car, whose sustentation depends on the buoyancy of the contained gas, which is lighter than air.

Captive.—A balloon restrained from free flight by means of a cable attaching it to the earth.

Kite.—An elongated form of captive balloon, fitted with tail appendages to keep it headed into the wind, and deriving increased lift due to its axis being inclined to the wind.

BANK: To incline an airplane laterally—*i. e.*, to rotate it about the fore and aft axis. Right bank is to incline the airplane with the right wing down.

BANKING RUDDER: See Aileron.

BAROGRAPH: An instrument used to record variations in barometric pressure. In aeronautics the charts on which the records are made are prepared to indicate altitudes directly instead of barometric pressure.

BIPLANE: A form of airplane in which the main supporting surface is divided into two parts, one above the other.

BODY OF AN AIRPLANE: A structure, usually inclosed, which contains in a stream-line housing the power plant, fuel, passengers, etc.

CABRÉ: A flying attitude in which the angle of attacks is greater than normal; tail down; down by the stern—tail low.

CAMBER: The convexity or rise of a curve of an aerofoil from its chord, usually expressed as the ratio of the maximum departure of the curve from the chord as a fraction thereof. "Top Camber" refers to the top surface of an aerofoil, and "Bottom Camber" to the bottom surface; "Mean Camber" is the mean of these two.

CAPACITY:

Lifting.—The maximum flying load of an aircraft.

Carrying.—Excess of the lifting capacity over the dead load of an aircraft, which latter includes structure, power plant, and essential accessories.

CARRYING CAPACITY: See Capacity.

CENTER: The point in which a set of effects is assumed to be accumulated producing the same effect as if all were concentrated at this point.

Of buoyancy.—The center of gravity of the fluid displaced by the floating body.

Of pressure of an aerofoil.—The point on the chord of an element of an aerofoil, prolonged if necessary, through which at any instant the line of action of the resultant air force passes.

Of pressure of a body.—The point on the axis of a body, prolonged if necessary, through which at any instant the line of action of the resultant air force passes.

CHORD:

Of an aerofoil section.—A right line tangent to the under curve of the aerofoil section at the front and rear.

Length.—The length of the chord is the length of the aerofoil section projected on the chord, extended if necessary.

CONTROLS: A general term applying to the means provided for operating the devices used to control speed, direction of flight, and attitude of an aircraft.

CRITICAL ANGLE: See Angle, Critical.

DÉCALAGE: An increase in the angular setting of the chord of an upper wing of a biplane with reference to the chord of the lower wing.

DEVELOPED AREA OF A PROPELLER: A layout of the area of a propeller blade designed to represent the total area of the driving face, in which the elements of area are developed as if unfolded onto the plane of the drawing (necessarily an approximation on definite assumptions, as no true development of the helix can be made).

DIRIGIBLE: A form of balloon, the outer envelope of which is of elongated form, provided with a propelling system, car, rudders, and stabilizing surfaces.

Nonrigid.—A dirigible whose form is maintained by the pressure of the contained gas assisted by the car-suspension system.

Rigid.—A dirigible whose form is maintained by a rigid structure contained within the envelope.

Semirigid.—A dirigible whose form is maintained by means of its attachment to an exterior girder construction containing the car.

DISK AREA OF A PROPELLER: The total area of the disk swept by the propeller tips.

DIVING RUDDER: See elevator.

DOPE: A general term applied to the material used in treating the cloth surface of air-plane members to increase strength, produce tautness, and act as a filler to maintain air-tightness; usually of the cellulose type.

DRAG: The total resistance to motion through the air of an aircraft—*i. e.*, the sum of the drift and head resistance.

DRIFT: The component of the resultant wind pressure on an aerofoil or wing surface parallel to the air stream attacking the surface.

ELEVATOR: A hinged surface for controlling the longitudinal attitude of an aircraft—*i. e.*, its rotation about the athwartship axis.

ENGINE, RIGHT OR LEFT HAND: The distinction between a right-hand and a left-hand engine depends on the rotation of the output shaft, whether this shaft rotates in the same direction as the crank or not. A right-hand engine is one in which, when viewed from the output shaft end, the shaft is seen to rotate anticlockwise.

ENTERING EDGE: The foremost part of an aerofoil.

FINS: Small planes on aircraft to promote stability; for example, vertical tail fins, horizontal tail fins, skid fins, etc.

FLIGHT PATH: The path of the center of gravity of an aircraft with reference to the air.

FLOAT: That portion of the landing gear of an aircraft which provides buoyancy when it is resting on the surface of the water.

FUSELAGE: See body.

GAP: The distance between the projections on the vertical axis of the entering edges of an upper and lower wing of a biplane.

GLIDE: To fly without power.

GLIDER: A form of aircraft similar to an airplane, but without any power plant.

When utilized in variable winds it makes use of the soaring principles of flight and is sometimes called a soaring machine.

GLIDING ANGLE: See Angle, Gliding.

GUY: A rope, chain, wire, or rod attached to an object to guide or steady it, such as guys to wing, tail, or landing gear.

HEAD RESISTANCE: The total resistance to motion through the air of all parts of an aircraft not a part of the main lifting surface. Sometimes termed "parasite resistance."

HELICOPTER: A form of aircraft whose support in the air is derived from the vertical thrust of large propellers.

INCLINOMETER: An instrument for measuring the angle made by any axis of an aircraft with the horizontal.

KEEL PLANE AREA: The total effective area of an aircraft which acts to prevent skidding or side slipping.

KITE: A form of aircraft without other propelling means than the towline pull, whose support is derived from the force of the wind moving past its surface.

KITE BALLOON: See Balloon, kite.

LANDING GEAR: The under structure of an aircraft designed to carry the load when resting on, or running on, the surface of the land or water.

LATERAL STABILITY: See Stability, lateral.

LEADING EDGE: See Entering edge.

LEEWAY: The angular deviation from a course over the earth, due to cross currents of wind.

LIFT: The component of the force due to the air pressure of an aerofoil, resolved perpendicular to the flight path in a vertical plane.

LIFT BRACING: See Stay.

LIFTING CAPACITY: See Capacity, lifting.

LOAD, FULL: See Capacity, lifting.

Reserve (or useful).—See Capacity, carrying.

LOADING: See Wing loading.

LONGITUDINAL: A fore-and-aft member of the framing of an airplane body, or of the floats, usually continuous across a number of points of support.

LONGITUDINAL STABILITY: See Stability.

METACENTER: The point of intersection of a vertical line through the center of gravity of the fluid displaced by a floating body when it is tipped through a small angle from its position of equilibrium and the inclined line which was vertical through the center of gravity of the body when in equilibrium. There is, in general, a different metacenter for each type of displacement of the floating body.

MONOPLANE: A form of airplane whose main supporting surface is disposed as a single wing on each side of the body.

MOTOR: See Engine.

NACELLE: See Body.

NATURAL STABILITY: See Stability.

NOSE DIVE: A dangerously steep descent, head-on.

ORNITHOPTER: A form of aircraft deriving its support and propelling force from flapping wings.

PITOT TUBE: A tube with an end open square to the fluid stream, used as a detector of an impact pressure. More usually associated with a concentric tube surrounding it, having perforations normal to the axis for indicating static pressure. The velocity of the fluid can be determined from the difference between the impact pressure and the static pressure. This instrument is often used to determine the velocity of an aircraft through the air.

PROPELLER:

Developed area of.—See Developed area of a propeller.

Disk area of.—See Disk area of a propeller.

Right-hand.—One in which the helix is right handed.

PUSHER: See Airplane.

PYLON: A marker of a course.

RACE OF A PROPELLER: The air stream delivered by the propeller.

RIB: See Wing.

RIGHT (OR LEFT) HAND:

Engine.—See Engine.

Propeller.—See Propeller, right-hand.

RIGID DIRIGIBLE: See Dirigible, rigid.

RUDDER: A hinged or pivoted surface, usually more or less flat or stream lined, used for the purpose of controlling the attitude of an aircraft about its vertical axis when in motion.

SIDE SLIPPING: Sliding toward the center of a turn. It is due to excessive amount of bank for the turn being made, and is the opposite of skidding.

SKIDDING: Sliding sideways in flight away from the center of the turn. It is usually caused by insufficient banking in a turn, and is the opposite of side slipping.

SKIDS: Long wooden or metal runners designed to prevent nosing of a land machine when landing or to prevent dropping into holes or ditches in rough ground. Generally designed to function should the wheels collapse or fail to act.

SLIP: This term applies to propeller action and is the difference between the actual velocity of advance of an aircraft and the speed calculated from the known pitch of the propeller and its number of revolutions.

SOARING MACHINE: See Glider.

SPREAD: The maximum distance laterally from tip to tip of an airplane wing.

STABILITY: The quality of an aircraft in flight which causes it to return to a condition of equilibrium when meeting a disturbance. (This is sometimes called "Dynamical stability.")

Directional.—Stability with reference to the vertical axis.

Inherent.—Stability of an aircraft due to the disposition and arrangement of its fixed parts.

Lateral.—Stability with reference to the longitudinal (or fore and aft) axis.

Longitudinal.—Stability with reference to the lateral (or athwartship) axis.

STABILIZER: See Fins.

Mechanical.—Any automatic device designed to secure stability in flight.

STAGGER: The amount of advance of the entering edge of the upper wing of a biplane over that of the lower; it is considered positive when the upper surface is forward.

STALLING: A term describing the condition of an airplane which from any cause has lost the relative speed necessary for steerageway and control.

STATOSCOPE: An instrument to detect the existence of a small rate of ascent or descent, principally used in ballooning.

STAY: A wire, rope, or the like, used as a tie piece to hold parts together, or to contribute stiffness; for example, the stays of the wing and body trussing.

STEP: A break in the form of the bottom of a float.

STREAM-LINE FLOW: A term in hydromechanics to describe the condition of continuous flow of a fluid, as distinguished from eddying flow where discontinuity takes place.

STREAM-LINE SHAPE: A shape intended to avoid eddying or discontinuity and to preserve stream-line flow, thus keeping resistance to progress at a minimum.

STRUT: A compression member of a truss frame; for instance, the vertical members of the wing truss of a biplane.

SWEEP BACK: The horizontal angle between the lateral (athwartship) axis of an airplane and the entering edge of the main planes.

TAIL: The rear portion of an aircraft, to which are usually attached rudders, elevators, and fins.

TAIL FINS: The vertical and horizontal surfaces attached to the tail, used for stabilizing.

THRUST DEDUCTION: Due to the influence of the propellers, there is a reduction of pressure under the stern of the vessel which appreciably reduces the total propulsive effect of the propeller. This reduction is termed "Thrust deduction."

TRACTOR: See Airplane.

TRAILING EDGE: The rearmost portion of an aerofoil.

TRIPLANE: A form of airplane whose main supporting surfaces are divided into three parts, superposed.

TRUSS: The framing by which the wing loads are transmitted to the body; comprises struts, stays and spars.
VELOMETER: See Air-speed meter and anemometer.
VOL-PIQUÉ: See Nose dive.
VOL-PLANE: See Glide.
WAKE GAIN: Due to the influence of skin friction, eddying, etc., a vessel in moving forward produces a certain forward movement of the fluid surrounding it. The effect of this is to reduce the effective resistance of the hull, and this effect, due to the forward movement of the wake, is termed the "wake gain."

In addition to this effect the forward movement of this body of fluid reduces the actual advance of the propeller through the surrounding medium, thereby reducing the propeller horse-power.

WARP: To change the form of the wing by twisting it, usually by changing the inclination of the rear spar relative to the front spar.
WINGS: The main supporting surfaces of an airplane.
WING LOADING: The weight carried per unit area of supporting surface.
WING RIB: A fore and aft member of the wing structure used to support the covering and to give the wing section its form.
WING SPAR: An athwartship member of the wing structure resisting tension and compression.
YAW: To swing off the course about the vertical axis, owing to gusts or lack of directional stability.

Angle of.—The temporary angular deviation of the fore and aft axis from the course.

WRIGHT PATENTS NOT RENEWED IN ENGLAND.—Mr. Wright has confirmed the story that no effort will be made to renew his British patents upon their expiration early in 1917.

"I don't think it is possible to renew our patent rights in other countries," he said, "and therefore it would be unfair to England to ask a renewal there.

"Patent rights in England are short-lived, and our rights in that country expire before any others. This naturally means that the rights may, under British law, be taken up by machine-makers there. However, machines made under such rights cannot be marketed outside of England."—*Aviation.*

TYPES OF ZEPPELINS USED IN RAIDS ON ENGLAND.—It would seem that Germany is using both old and new airships for cross-Channel raids. The following from *Aviation* refers to the *L-21,* shot down near Enfield on September 21:

Owing to the meager information that has reached this country, and to the fact that a very large proportion of the ship was destroyed by the heat of the burning gases and the final impact when it struck the ground, it has not been positively established what particular type this machine represented. English aeronautical journals are unanimous in the declaration it was a Schütte-Lanz, probably an old one, which would indicate it to have been about a fourth-rate airship. It is a well established fact that the characteristic Zeppelin aeroplane has its gas bag braced by box-girder construction of aluminum alloy. Judging from the photographs which appeared in this country, this form of construction was not used in the airship brought down at Enfield; on the contrary the chief peculiarity of the mass of wreckage is to be found in the quantities of wire bracing. There is said to have been enough wire to fill completely 36 motor lorries. The wire bracing probably shows that the bracing of the airship's gas bag was of wood. Wood construction would be an indication that the craft was probably a Schütte-Lanz, which is well known to be built with a trellis-like wooden framework. The motors, from the vague descriptions and indistinct photographs that have appeared in this country, were of the six-cylinder upright vertical type. The characteristic Mercédès overhead valve

gear appears to be lacking. It is possible that they may have been 180 horse-power Maybach engines.

The airship was fitted with four motors, and if the surmise that they were 180 horse-power Maybachs is correct, the machine had a total of 720 horse-power. Each engine was fitted with a demultiplication gear-box and propeller shaft in line with the engine, showing that the gondolas each had a propeller at their stream-lined sterns instead of bevel-driven cross shafts to propellers at the side of the airship as in the Zeppelins. The airship was of stream line form.

Engineering (London) gives the following description of the *L-33*, an example of the modern type:

According to *The Times*, the Zeppelin which came down on September 24, in Essex, has a framework or skeleton composed of a series of longitudinal lattice-work girders running from end to end and connected at intervals by circular lattice-work ties, the whole structure being bound together and stiffened by means of a system of wires provided with arrangements which enabled them to be tightened up. The material used is an alloy of aluminum, resembling, but, it is said, inferior in quality to, that known in this country as duralumin. At the largest point the framework has a diameter of 72 feet, and is of stream-line form, the bow being sensibly blunter than the stern, which, indeed, tapers off to a sharp point. The length of the vessel appears to have been 650 feet or 680 feet, and the weight complete with engines, fuel, guns and ammunition, is calculated at 50 tons. The hydrogen capacity was 2,000,000 cubic feet, and there were 24 ballonets, extending the whole length of the ship. The airship was built last July, and its cost is estimated by the Admiralty authorities at about a quarter of a million. To enable the crew, which consisted of 22 men, to move from one part of the ship to another a cat-walk ran along the keel, enclosed in an arched passage. It consisted of a narrow footway, 9 inches in width and made of wood—one of the very few examples of wood construction used—and provision for ventilation was made in the shape of shafts rising to the top of the ship. In all there were four gondolas—one forward, two amidships, and one aft. The forward one constituted, as it were, the navigating bridge. It was divided into three parts. The first was set apart for the commander, and in it were concentrated the controls of the horizontal and vertical rudders at the stern (where also there were four stabilizing fins to prevent rolling), the engine-room telegraphs, and the switches for the electrical release of the bombs. These last, of which 60 were carried, were arranged amidships, and the sliding door which was opened to allow them to fall can still be seen moving freely on its bearings. Behind the commander's room in the forward gondola was a cabin for the wireless operator, measuring perhaps 6 feet by 4 feet, and behind that again an engine-room containing a 240 horse-power Maybach-Mercédès engine having six vertical cylinders. Behind the engine was a clutch, a brake, and a reducing gear, through which the power was transmitted to a propeller shaft; a generator for the wireless installation was placed in front. One similar engine was carried in each of the gondolas amidships, and three in the aft gondola, all the engines having wireless generators attached. There were thus six engines, with an aggregate power of 1440 horse-power, and six propellers. Of the latter, three were worked from the aft gondola, one being placed in the center at a point distant from the tail about one-fifth of the length of the ship, and the other two one on each side; two were driven from the side gondolas amidships, and the sixth was in connection with the forward gondola. To reduce air resistance a streamline form was given to the propeller stays by the aid of a thin two or three-ply wooden casing shaped in the proper way. The amount of petrol carried was 2000 gallons, and the speed is supposed to have been about 60 miles an hour in a still atmosphere. The armament, apart from the bombs, consisted of nine quick-firing guns. Of these two, larger than the others, were mounted on the roof, two were in the forward gondola, one each in

the amidships gondolas, two in the aft gondola, and one in the tail. The lightness of the construction is shown by the fact that the huge tail, still containing the remains of the gun platform, can easily be rolled over by one man.

A SPERRY NIGHT FLYING EQUIPMENT.—A lighting outfit, in addition to full equipment of automatic control devices, is the latest safety appliance produced by the Perry Gyroscope Company. Three 50 candlepower searchlights are attached to a fitting on the upper entering edge of the biplane which Lawrence Sperry has been using in night flying experiments at Amityville, L. I., for the past few weeks.

The searchlights are mounted in parabolic reflectors which, it is claimed, increase the candlepower to 40,000 for each lamp. The fitting, which secures the lamps to the upper plane, is designed so that it can be tilted in the vertical plane by turning a knob, which is placed within easy reach of the pilot's hands.

This device makes signaling with the searchlights a possibility, as well as focusing them on any given point, when the pilot is ready to make his landing. The Morse code can also be used with these searchlights, as the lights themselves are controlled by a switch normally held open by a spring, which can be operated like a telegraph key.

The electric current is supplied by a generator of 150-watt capacity, which is driven by the air pressure at, approximately, 4,000 revolutions per minute. Provision is made for any accident to the generator by means of a storage battery, which in case of trouble is automatically thrown into the circuit.

The machine Mr. Sperry has been using is also equipped with the Sperry automatic pilot and synchronized drift indicator. A Sperry air compass, protected by a waterproof hood, is also part of the equipment.—*Aviation*, 1/10.

HIGH ALTITUDE FLIGHT REPORTED.—A dispatch from Turin to the *New York Herald* says that an Italian aviator, carrying two passengers in a military airplane, reached a height of 20,670 feet.

TEST OF AN AIRPLANE MOTOR.—The results of the tests of the largest aeronautical motor in the world, which may contribute greatly toward placing the United States in the lead in aeronautic motors in the near future, were reported to the Aero Club of America yesterday by G. Douglas Wardrop, the editor of *Aerial Age* and a member of the Aero Club of America, who has just returned from Springfield, Mass., where he observed an eight hour test of the motor.

This 300 horse-power aeronautic motor, which is equipped with an electric self-starter, was designed and constructed by Frank H. Trego, chief engineer of the Knox Motor Company, of Springfield, Mass., to meet the increasing demand for motors of large horse-power for large battleplanes and seaplanes. European countries have motors of up to 200 horsepower, but not of 300 horse-power, and they have been asking for such a motor in large quantities. Several orders of from 100 to 2000 motors of this horse-power have been going a begging in the last two years, there being no such motor available.

Mr. Wardrop's report states that the motor complete, including electric starter, attachment for driving a wireless apparatus on a battleplane, revolution counter, tachometer to show the propeller's speed, exhaust pipes, etc., weighs only 1400 pounds. During the eight hour test this motor was equipped with a four bladed propeller, 14 feet in diameter. The motor turned at between 1100 and 1200 revolutions a minute. At that speed the pull of each propeller blade on the propeller hub is about 20 tons. The test was carried out on a Sprague electric dynamometer of 500 horsepower capacity.

The tests, which were successful in every way, were watched by aeronautic and automobile authorities, who were greatly pleased with the results, and stated that they considered the advent of this motor to be one of the most important developments in American aeronautics in the last year.—*N. Y. Herald*, 13/11.

TABLE SHOWING PROBABLE ZEPPELIN LOSSES FROM AUGUST 1, 1914, TO NOVEMBER 15, 1916

No.	Name	Place	Date	Cause of Loss
1	Z-8*	Badonvillers, France ...	22- 8-1914	Destroyed by French gunners. Part of crew lost.
2	Z-5*	Mlava, Russia	29- 8-1914	Destroyed by Russian gunners. Crew lost.
3	?*	Seradz, Russia	6- 9-1914	Captured, while at anchor, by a cavalry patrol. Crew of 30, prisoners.
4	?	Düsseldorf, Germany ...	9-10-1914	Destroyed in shed by British aviators.
5	LZ-31*	Friedrichshafen, Germany.	21-11-1914	Destroyed in shed by British aviators.
6	?	North Sea	23- 1-1915	Foundered during a storm.
7	L-3*	Esbjerg, Denmark	17- 2-1915	Stranded, having run out of fuel, and broke up. Crew of 16 interned.
8	L-9*	Boulogne, France	5- 3-1915	Foundered during a storm, after having raided Calais. Crew lost.
9	L-8*	Tirlemont, Belgium	4- 3-1915	Damaged by British aviator; wrecked on landing. 21 of crew killed.
10	?	Thielt, Belgium	12- 4-1915	Damaged, over Béthune, by French gunners; wrecked on landing.
11	?*	North Sea	26- 5-1915	Broke away without crew; foundered off Heligoland.
12	LZ-37*	Evere, Belgium	7- 6-1915	Destroyed in shed by British aviators.
13	LZ-38*	Ghent, Belgium	7- 6-1915	Destroyed in mid-air by British aviators; crew lost.
14	L-?*	Ostende, Belgium	10- 8-1915	Raided London. Destroyed, upon her return by British aviators.
15	?*	Vilna, Russia	24- 8-1915	Shot down by Russian gunners; crew of 10 made prisoners.
16	?*	Saint-Hubert, Belgium ..	13-10-1915	Destroyed by exploding in mid-air.
17	?	Maubeuge, France	16-10-1915	Stranded on a chimney and broke up.
18	?	Grodno, Russia	5-11-1915	Destroyed by the storm on landing.
19	L-18*	Tondern, Germany	17-11-1915	Wrecked in shed through an accidental explosion.
20	Z-28	Hamburg, Germany	17-11-1915	Wrecked by the storm.
21	L-22*	Tondern, Germany	1-12-1916	Destroyed in shed through accidental explosion of a bomb.
22	?*	Kalkun, Russia	5-12-1916	Shot down by Russian gunners. Crew lost.
23	?*	Mainvault, Belgium	30- 1-1916	Raided Paris. Damaged by French aviator; wrecked on landing.
24	L-19*	North Sea	21- 2-1916	Raided England. Probably run out of fuel; foundered. Crew lost.
25	LZ-77*	Révigny, France	21- 2-1916	Shot down by French motor guns; destroyed in fall. Crew of 15 killed.
26	L-15*	Kentish Knock, England.	1- 4-1916	Shot down by British gunners; crew of 18 surrendered. Vessel sank.
27	L-20*	Stavanger, Norway	3- 5-1916	Raided Scotland. Stranded, having run out of fuel and drifted with the wind. Blown up by crew; 3 killed, 16 interned.
28	L-7*	Off Schleswig Coast....	4- 5-1916	Shot down by H. M. S. *Galatea* and *Phaoton*, and destroyed by submarine *E-31*.
29	?*	Salonika	5- 5-1916	Shot down by Allied Warships.
30	L-21*	Enfield, England	2- 9-1916	Shot down by aeroplane during raid on London.
31	L-32*	England	24- 9-1916	Shot down by anti-aircraft guns in Essex while returning from raid on London.
32	L-33*	England	24- 9-1916	
33	?	England	1-10-1916	Shot down by gunfire while attempting to reach London.

* Destruction authenticated.

The *London Times* gives the number of Zeppelins definitely known to have been destroyed up to the 5th of September as 16, and appends the following table of raids on England since the war began.

Date	District	Casualties	
		Killed	Injured
1915			
Jan. 19	Yarmouth and King's Lynn	4	9
April 14	Blyth and Tyneside	..	2
April 16	Lowestoft, Ipswich, and Bury St. Edmunds.	..	..
May 10	Southend	1	..
May 17	Ramsgate	2	8
May 27	Southend	3	..
May 31	Outlying Districts of London	6	..
June 4	East and South-East Coasts	..	..
June 6	East Coast	24	40
June 15	North-East Coast	15	15
Aug. 9	East Coast	13	12
Aug. 12	East Coast	6	23
Aug. 17	Eastern Counties	10	36
Sept. 7	Eastern Counties and London District	17	39
Sept. 8	Eastern Counties and London District	20	86
Sept. 11	East Coast	..	..
Sept. 12	East Coast	..	..
Sept. 13	East Coast	..	..
Oct. 23	Eastern Counties and London Area	55	114
1916			
Jan. 31	Midland Counties	67	117
March 5	Yorkshire and 7 other Counties	12	33
March 31	Eastern Counties and North-East Coast	43	66
April 1	North-East Coast	16	100
April 2	S. E. Scotland, N. E. Coast, and E. Counties of England.	10	11
April 4 (2–3 a. m.)	East Anglian Coast	..	..
April 5	North-East Counties	1	8
April 24	Eastern Counties	..	1
April 25	Essex and Kent	..	..
April 26	East Coast of Kent	..	..
May 2	North-East Coast and South-East Coast of Scotland.	9	27
July 29	East Coast	..	..
July 31	Eastern and South-East Counties	..	..
Aug. 3	Eastern Counties	..	..
Aug. 8	Eastern and North-East District	8	17
Aug. 25	East and South-East Coasts	8	22
Sept. 4	Eastern Counties and Midlands	2	13

The totals are 352 killed and 799 injured.

LESSONS OF THE WAR

ADMIRAL FISKE ON WHAT THE VISIT OF THE "U-53" PORTENDS TO THE UNITED STATES.—The following interview with Rear Admiral Fiske is reprinted from the *New York Times* of October 15, 1916:*

"The recent dramatic exploits of the *U-53*, which have created so much disturbance in our commerce that one might almost imagine that an actual blockade threatened the American ports, is one of the most fortunate things that could have happened to this country, because it shows to the people, more clearly than mere argument, history, or statistical statements could possibly do, the possibilities that follow unpreparedness.

"If the *U-53* got as far as the vicinity of Newport undetected, she could have gone into the harbor itself undetected, and could have sunk one or more of our battleships without our even knowing the cause of their sinking.

* Copyright by *New York Times*.

. "If she could go into Newport, she could go into New York Harbor, or go to Philadelphia, or to Baltimore, or Boston.

"If one submarine could go, more could go. How many submarines of the same remarkable type as the *U-53* Germany has we do not know, but we have every reason to believe that she has a great many, efficiently built, and efficiently handled. Therefore, this recent demonstration of abilities of the new German submersible cruisers is exceedingly important. How important it is, we do not know yet. *It depends entirely upon how widely it wakes the American people up to a comprehension of demonstrable facts.*

"That this country of one hundred million people should find itself in such a condition of unpreparedness is unfortunate; that it may be disastrous in the end is a possibility foreshadowed by many facts in history, since similar conditions have been disastrous to many nations in the past. In fact, *all the nations in the past that have been great, and then fallen from greatness, have fallen because they have permitted themselves to lapse into a condition of unpreparedness of which some warlike nation has taken advantage.*

"The *U-53* does not of herself constitute a great danger to the United States; but the condition of national defencelessness which her startling appearance off Newport illuminated, and which the instantaneous drop in stocks confessed, constitutes a national danger of the most formidable kind.

"If one submarine could come across, a fleet could do the same; that is, a war fleet of battleships, cruisers, and the rest, which we should be compelled with our present active fleet to meet. The chief lesson which the *U-53* has so clearly demonstrated is the fact that we should receive no warning of our danger; for if we ever get into war with a real military European country we shall find that it will be almost as difficult to get warning of the coming of that country's fleet as it would have been to discover the approach of the *U-53*. The chief reason for this is that we have no scout ships or battle cruisers with which to find an enemy fleet.

"In case of war it is more than probable that we should hear merely that a large fleet had sailed from Europe, destination unknown. We might hear no more than that of it until it appeared in the vicinity of New York, the Chesapeake, the Caribbean Sea, or the Panama Canal.

"The *U-53* has shown us how accessible our shores are to Europe, the pacifists to the contrary notwithstanding.

"Long ago the probability of some such demonstration as the *U-53* has given us was clear. In fact, it became my duty at one time to point out the dangers into which the present war would plunge the United States; and I did so in my official letter to the Secretary of the Navy, dated Nov. 9, 1914, which reported also that the navy was unprepared for war.

"The clearest consequences of our national policy of unpreparedness is to submit us to the menace of blockade. Blockade can be established without an actual state of war, without even a declaration of war. It has often been used by nations to bring other nations to terms; it is an act just short of war.

"Many people think a foreign nation cannot harm us unless it actually invades our soil. They do not realize that every great nation of to-day is like a great business firm, that blockades of its coast would stop a very large proportion of its business transactions, and that it would harm its commercial prosperity to a degree that would depend on how greatly the nation was a manufacturing and exporting nation. Any blow to any of these great national business organizations would produce an effect wherever the mail and telegraph go.

"The organizations dealing with foreign commerce in every great nation are so excellent and so precise that the business system by which any nation holds it international trade is like a machine. In fact, it is a machine, with all the faults of a machine. One of the chief faults of a machine is the serious disturbance that may be produced by a cause seem-

ingly trivial. Such is the case with the machine which the commerce of every great nation composes. Everyday experience confirms this. Order reigns so long as the steamers come and go with regularity, so long as the money comes in at the proper intervals, and is distributed where it ought to go, and so long as the people continue to live their habitual lives.

"Consider, however, what would happen if the coming and going of all the steamers were suddenly stopped by a blockade. It may or it may not be true that in a great country like the United States no foreign trade is really necessary. It may be true that the people of the United States would be just as happy if they had no foreign trade, even if they were not so rich. But the United States has a foreign trade; and in case of blockade this would be stopped with a jerk, and there would follow a chaotic condition which cannot be described, because chaos cannot be described. Hundreds of thousands of people would be thrown out of employment, and the whole rapidly moving and enormous mass of American daily life would receive a knockout blow.

"It is true that wars have happened in the past in which there has been a blockade of our coast more or less complete and no extraordinary suffering has been occasioned, but in all cases peace was declared before the suffering produced had become very acute. Furthermore, the complicated conditions of trade which now exist never existed before. We were not so dependent then as now on the artificial accessories of living.

"A blockade of any of our great eastern ports would entail many indirect disasters. The sudden stoppage of our sea trade, which, of course, includes our coast trade, by even a partial blockade of our ports, would practically change all the conditions under which we now live. Hardly a single organization in the country would fail to be affected by it. This condition would last as long as the blockade lasted, and would create a disorder that could only be corrected by the raising of the blockade.

"It is easy to see, therefore, that the blockading of our principal ports would be a disaster inferior only to the disaster of actual invasion.

"Even the disaster of the total destruction of our fleet by an enemy fleet would only have the direct result that the people of the country would have fewer ships to support and fewer men to pay. The loss of the fleet and the men would not be *per se* any immedate loss to the country, but rather a gain. The loss of the fleet, however, would make it possible for the enemy fleet to blockade our ports later and thus bring about the horrors of which we have spoken.

"The lesson of the *U-53*, while not establishing the possibility of what may be called an 'air-tight blockade' of our long coast at the moment, indicates the possibility of a partial blockade in the future, a blockade that would make it exceedingly risky for vessels to break; such a blockade as was maintained during the greater part of the civil war by the Northern States against the Southern States.

"The blockade would be more distressing to us, however, than it was to the Southern States, or to any agricultural country 50 years ago, for two very important reasons:

"First—The progress of modern engineering has made navies much more powerful.

"Second—The great countries now are much more vulnerable to blockade, because they hold so many millions of people dependent upon manufacturing industries, who are forced to live an artificial life in cities.

"The United States may not depend for its daily bread upon the regular coming of wheat from over the seas, but millions of its people do depend, directly and indirectly, upon the money earned from the export of manufactured things. A country becomes dependent upon outside commerce through habits and modes of life, just as a man does upon outside air. Therefore a people suddenly deprived of a vigorous outside commerce would be commercially smothered.

"To give a rough idea of the possible effects of a blockade of our coasts consider the fact that our exports last year were valued at more than

$2,000,000,000, which means that goods to this amount were sold and paid for either in money or its equivalent, most of it ultimately as wages for labor.

"No blockade, of course, could stop all this, but it seems probable that it could stop half of it, after our fleet was destroyed by the enemy. It would seem, therefore, that the primary use for our navy will probably be to prevent blockade. It must be understood that a blockade does not require a declaration of war or entail the costly operations of invasion. A blockade, though slower in its effects than actual invasion, is practically as efficacious in the end, and it is much less expensive. *It is cheaper and easier.*

"The fact that the coast of the United States is so long is an argument often used to show that it would be impossible to blockade it. It is not at all necessary, however, to blockade the entire coast of the United States in order to create a condition of distress such as has just been pointed out. It would suffice to blockade Boston, New York, the Delaware, the Chesapeake, and the Gulf, say, with 40 ships. The difficulties and risks of running such a blockade, in defiance of the present increased power and accuracy of modern gunnery, the searchlights, the wireless telegraph, and the aeroplane, would be numerous and great, and cause high insurance rates.

"It may be obejcted that this blockading of even a defenceless coast would cost the blockading country a great deal of money because of the loss of trade with that country. Of course; but war expenses are to be expected, and the blockade would be far more expensive to the blockaded country, which would be compelled to yield in the end, not only because of the blockade itself but because of the pressure of neutral countries. Of course, the longer we held out the greater the indemnity we should have to pay. The expense of blockading, therefore, would be merely a profitable investment for the blockader.

"It is true, of course, that actual invasion of a country from the sea would be a greater disaster than blockade, and danger from invasion has been the reason given by Great Britain for the building of her own great navy; and it is also true that in the minds of many people the primary reason for a navy has been for defence against invasion.

"But why should an enemy take the trouble to invade the United States when it would be so much easier and cheaper to establish a blockade of our coast? A blockade would in the end accomplish everything that an enemy could desire, especially if it were enlivened by the occasional dropping of thousand-pound shells into Wall Street and the Brooklyn Navy Yard.

"There are some who believe that the probability of our becoming involved in a war with a great naval nation is so slight that blockade is not worth thinking about. Perhaps the time has come when it will be well to consider what factors determine the degree of probability.

"It is clear that as between two countries of equal wealth the probability of war varies with the disparity between their navies; and unless other nations are involved, is practically zero if their navies are equal in power. Therefore, the *greatest probability of war is between two countries of which one is the more rich and the other the more powerful.*

"Following the procedure that many great nations have followed in the past, it would not be an impossible thing for even Great Britain, our nearest international relative, if she saw us gradually surpassing her in commercial strength, to challenge us while our navy was weak, relatively, to hers, and crush us. It has often been said that Great Britain could not afford to go to war with us, because so many of her commercial interests would suffer. Of course they would suffer for a while. But commercial interests suffer in commercial wars, and yet commercial wars are carried on frequently and relentlessly, until one party or the other has to yield.

"Just now Great Britain does not wish to crush us. It is certain, however, that she can. It is certain that the richest country in the world lies defenceless against the most powerful, and that we could not alter this condition in

ten years, even if we started now to build and develop a navy that would be adequate in time.

"In case the degree of probability of war with Great Britain, now or at any future time, seems so small that we need not consider her, are there no other great powers with whom the degree of probability of war is great enough to make it wise for us to consider them? After the treaty of peace shall have been signed, and all the nations now warring find themselves bound together by the tie of a common necessity (that of getting money), is it inconceivable that they should turn eager eyes toward the richest and weakest country in the world? And is it inconceivable that the eyes of the Orient should turn toward her at the same time?

"Such ideas seem to be forming in the public mind gradually and doubtfully. But the recent submarine attacks so near our Atlantic coast tend to crystallize those ideas and awaken the people to the fact that an epochal thing has happened, and that the living and growing danger of blockade has been pointed out."

INFLUENCE OF THE TORPEDO ON BATTLESHIP DESIGN.—Possibly the most noteworthy early example of internal defence against submarine explosion is presented by the French coast-defence ship *Henri IV*, in which ship an immense amount of armor was worked into the lower portions of the hull. In addition to flat decks both above and below the main belt there are lateral armored bulkheads which extend downwards from the lower armored deck to the bilge keel line, and the side below the belt amidships has 3-inch plating down to a considerable depth. The total weight of armor in this small ship is 3500 tons, or nearly 40 per cent of the entire displacement. That the new measures were partly efficacious has been proved by the manner in which certain modern ships have survived the explosion to torpedoes. The French battleship *Jean Bart*, attacked by an Austrian submarine, was able to make her way to a base several hundred miles distant, where she was very quickly repaired. In the battle of Jutland Bank the *Marlborough* was struck by a torpedo and took up a considerable list to starboard, yet in spite of the damage she kept her place in the line and reopened fire nine minutes later. More recently the German battleship *Westfalen* was successfully attacked by a British submarine. At least one torpedo got home, but the Germans claimed that the second went wide, and that the vessel was brought safely into port. On the other hand, many older vessels, built before the torpedo had become a serious menace, have succumbed to a single blow. The torpedo, however, like the gun, is rapidly increasing in potency. From 14 inches the diameter has risen to 21 inches, and in the latest models the the war-head contains about 300 pounds of trinitrotoluol. A few years hence these figures will be surpassed, for there are no technical difficulties in the way. Hitherto it has been necessary to keep the weight and length of torpedoes within reasonable limits in order to facilitate their handling. But as destroyers and submarines grow larger and able to carry heavier weights, the need for restricting torpedo dimensions will no longer obtain. Thus, what is considered adequate internal protection against existing torpedoes may be powerless to resist the attack of the more formidable weapons which are sure to appear in a few years' time.

Though the submarine has not proved itself as formidable a tactical factor as Admiral Sir Percy Scott and several other authorities apprehended before the war, it has unquestionably modified naval operations both tactically and strategically. Through its agency the torpedo has ceased to be a remote and casual danger, to counter which certain precautions of a somewhat perfunctory nature were deemed sufficient. Not even a close screen of destroyer patrols can always guard a capital ship against submarine attack; and as for the torpedo nets on which reliance used to be placed, these have been shown up as a snare and a delusion. The construction of submarines with speed and maneuvering qualities vastly

superior to the present standard will be made possible by improvements in the internal combustion engine. Boats of this description will obviously constitute a much greater danger to the capital ship, for their speed and handiness will give them more opportunities to attack than the present-day submarine enjoys. And their attack, when delivered, will be the more effective owing to the deadlier torpedoes with which they will be armed. It is apparent, therefore, that the capital ship will henceforth have to reckon with torpedo attack under all conditions, and unless given means to resist this form of assault it will at all times be exposed to the risk of sudden destruction. Whether the significance of this fact has been fully grasped by those whose business it is to design our warships can only be conjectured. Many years elapsed between the introduction of the shell gun in foreign navies and the building of armor-plated ships in our own. There was an almost invincible prejudice against armor, and it was not until the battle of Sinope and other naval incidents in the Near East had revealed the tremendous effect of shells against unprotected wooden ships that the authorities began seriously to consider the adoption of armor. But in a very short time after the first cautious step had been taken the building of ironclad ships became general, and designers ceased to be appalled at the notion of devoting about 30 per cent of available displacement to iron plates. Fortunately the traditional conservatism of the navy has been less in evidence of late years, and especially during the war have our constructors shown great boldness and adaptability. The "torpedo-proof" monitors sent to the Dardanelles are a case in point, and there are countless other instances which it is not expedient to cite. In view of the good results which have been attained in this direction, when time was limited and everything had to be improvised, it is not too much to hope that still more effective work will be possible when we revert to normal conditions. The really efficient capital ship of the future will be a vessel which, in addition to having the highest qualities of armament and protection against gun-fire, will be virtually immune from serious damage by underwater attack. In all likelihood this immunity will be conferred by some modified form of the girdle which has been fitted to the monitors. To dispose this belt in such a manner as not to diminish speed, yet to make it proof against the strongest torpedoes likely to be produced, will be a knotty problem to solve. A considerable increase in displacement must be looked for, as the adoption of the new belt will entail greater breadth; which, unless it be found possible to fine the ends of the ship and thus obtain a finer block coefficient, will call for more engine-power to attain the desired speed. On the other hand, an important saving could be effected by discarding the armored torpedo bulkheads below water, since if the anti-explosion belt did its work these would be superfluous. We may add that, to be thoroughly effective, this system of resisting explosion should extend over the whole underbody of the ship, for a belt merely deep enough to arrest torpedoes would not necessarily afford protection against mines. No system of internal protection, however elaborate, which depends on armored bulkheads and subdivision, is likely to prove as satisfactory as the explosion-proof belt or cofferdam. This has been demonstrated both by experiments in peace and by the test of war. Longitudinal protective bulkheads, especially when placed too near the side of the ship, may actually constitute a source of danger. In a paper read before the Institution of Naval Architects mention was made of one experiment in which a thick bulkhead, fitted at the usual distance from the side, was broken up by the force of a submarine explosion and was hurled through the inner bulkheads, wrecking the boilers in its course, more damage resulting apparently than if the outer bulkhead had not existed. To prove really effective, it has been stated, the outer explosion bulkhead ought to be at least 15 feet from the side of the ship. This suggests the possibility of filling the intervening space with some shock-absorbing and water-excluding material. Such an arrangement would certainly mean the pre-emption of much

valuable space, but it would not be too high a price to pay for almost absolute immunity from a particularly dangerous form of attack.

The Naval Power which is first in the field with a squadron of capital ships proof against both torpedo and mine will enjoy an advantage difficult to over-estimate. The indecisive character of naval operations in the present struggle has been largely owing to the development of underwater attack. At the Dogger Bank engagement of January 24, 1915, the German battle-cruiser squadron would probably have suffered far more severely than it did had not the necessity of safeguarding his ships against submarines and mines compelled the British admiral to relax the pursuit. Again, there is every reason to believe that the battle of Jutland Bank would have been renewed on June 1 with decisive results had not the night dispositions which Admiral Jellicoe was forced to make in order to preserve his fleet from destroyer attacks allowed the Germans to slip back to their ports under cover of darkness. The consciousness of immunity from torpedoes and mines would, in fact, be an asset of incalculable value to any commander, however bold and resourceful he might be. It would enable him to pursue tactics which are entirely ruled out in existing conditions, and to exploit to the utmost his superiority in gun-power and speed. A point so obvious as this does not need to be labored.

Reviewing the experience of the war to date, we may safely conclude that capital ships will continue to form the backbone of every fleet, and that they will steadily grow in size and cost. The suggestion heard early in the war, when submarines were claiming many victims, that great armored ships were useless luxuries, and that command of the sea could be secured by submarine torpedo craft alone, is now seen to be fallacious. There is no short cut to sea power. In the future, even more than in the past, that power will be expressed in squadrons, each unit of which will cost as much as a whole division of older capital ships. The demand for larger guns, higher speed, thicker armor, and protection against submarine explosion bids fair to lead to the construction of ships which will as far outclass the early dreadnoughts as the dreadnought outclassed the formidable type. Heavy as the burden of armament promises to become in future, it is consoling to reflect that the almost prohibitive cost of the capital ship will render it impossible for any single state to inaugurate such an era of feverish naval expansion as that for which Germany was responsible in recent years.—*The Engineer*, 13/10.

MONITORS.—The construction of monitors by Great Britain and other belligerent powers has excited interest in naval circles in all countries. The *Army and Navy Journal* presents the following summary of the uses that have been made of the monitor in the present war:

"Reports of various naval operations in the European war show that the monitor is a type of fighting ship that several of the foreign navies have a definite faith in. From the time the Germans reached the North Sea ports of Belgium and established a great submarine base at Zeebrugge the British Navy has been using monitors for the bombardment of that port and the German positions along the coast. One of the striking features of the expedition to the Dardanelles was the presence of some great seagoing monitors in the British fleet that were engaged in the naval attack on the Turkish forts of the Gallipoli peninsula. Early in the present month reports came from France that a light type of monitor had been sent up the River Somme and through the system of canals that spread their watery network over that part of France and Belgium to assist in the artillery attacks on the German lines in the battle of the Somme. On the Danube, according to the official German report of October 3, 'Austro-Hungarian monitors in the Danube destroyed the pontoon bridges in the rear of the Roumanian troops who had crossed the Danube south of Bucharest.'"

Technical journals are unanimous in praise of the work that has been accomplished by Great Britain's seagoing monitors and prophets have come forward to state that the battleship of the future will be a swing back to the monitor type. The more conservative journals are, however, careful to point out that the monitor in the present war has been a success because it is a special type built to fit special circumstances and results so far give no reason to believe that its characteristics fit it for service in that line of battle. A few proposed designs for capital ships have recently been published here and abroad in most of which the enthusiasts find reason to believe that the monitor idea predominates. An example is the design for a 26-knot battle cruiser credited to Colonel Ferreti. He proposes to mount ten 15-inch guns in two 5-gun turrets on a 32,000-ton ship with a 12-inch armor belt. The monitor idea is said to play a prominent part in the design because of unusually low free board and absence of useless superstructure. There is a strange absence of comment on the facts that the trend in battleship design for the past several years has been toward elimination of top hamper, and that low free board is to be expected in ships built for service in the Mediterranean. The lessons of the present war have doubtless influenced this as well as other recent designs, but the predominance of the monitor idea is, to say the least, not self evident in any of them.

MERCHANT MARINE

UNITED STATES MERCHANT FLEET INCREASES.—The United States Bureau of Foreign and Domestic Commerce announces that American shipping in foreign trade has increased from 2405 vessels of 1,076,152 gross tons on June 30, 1914, to 3135 vessels of 2,194,470 gross tons on June 30, 1916. Coincident with this announcement the *New York Times* publishes a report that the American line is planning the construction of four 32,000-ton, 25-knot, oil burning liners for service between New York and Liverpool, adding, however, that officials of the company declare that the present mail subsidy of $4 per ship-mile must be considerably increased to warrant putting these vessels in service.

GERMAN MERCHANT FLEET NOT INCREASING.—*Shipping Illustrated* publishes an "authentic report" that Germany is not building new merchant steamers, such work as has been done since the outbreak of the war having been confined, with few exceptions, to ships ordered previous to the outbreak of hostilities. Statements from the Hamburg-American and North German Lloyd officials are given as authority for the report.

PROFITS OF SUBMARINE MERCHANTMEN.—Submarine blockade running appears to be worth something over 300 per cent, according to reported figures incidental to the *Deutschland's* dash across the Atlantic. Including the cost of construction, the expense of operation, overhead charges, cost of cargo and administration expense, the outlay was slightly over $1,000,000. The cargo is said to have been marketed on this side for about $3,300,000, which would leave a net profit of nearly $2,300,000. The percentage of profit on the cargo alone was something like 500. Yet the German director of the North German Lloyd says the submarine *Deutschland* would not be used after the war, as the cost of operation was too great.—*Army and Navy Journal*, 23/9.

SHIPBUILDING IN GREAT BRITAIN.—In a leading article on "The Tonnage Shortage and the Remedy" the *Liverpool Journal of Commerce* points out that the British mercantile marine has suffered a loss equivalent to 4,000,000 tons of shipping, detailed as follows: Hindrance of new construction, 1,700,000 tons; war losses, 1,520,000; excessive depreciation, 1,000,000 tons.

Quoting *Lloyd's Register* for the quarter ended September 30, 1916, in which vessels completed only totaled 71,000 tons gross, the *Journal* says: "Seventy thousand tons per quarter, or one decent ship a week, is a ridiculous output. In spite of admitted difficulties, it is hard for the outsider to believe that this cannot be improved, while every one claiming any general knowledge of the situation is well aware that many more ships could be turned out without at all interfering with the more urgent requirments of any other section of our fighting machinery."

The paper asserts that a constantly increasing multitude of officials is being employed to stifle the best efforts of shipbuilders and apparently to insure that what available labor and material there are shall be wasted, and urges the necessity of appointing one strong man to govern everything, to see that available supplies are not frittered away, to insure that the man who can best build big ships gets big ships to build, and in general to arrange things on a sensible basis.

"What is required," the paper says, "is the appointment of a dictator, an individual who is intimate with the shipbuilding industry and whose career is a guarantee of strength of character, soundness of judgment, and outstanding ability. Such a man could be found if desired, and if such an appointment were immediately announced the relief to the shipbuilding world would be instantaneous."—*N. Y. Times*, 2/10.

JAPAN'S PART IN TRANS-PACIFIC COMMERCE.—The lead that Japan has obtained in commerce on the Pacific is reflected in a report from Consul General George Anderson, at Hongkong, that the Toyo Kisen Kaisha, the largest Japanese steamship company in the trans-Pacific trade, is building a new steamer designed to be the largest and the fastest on the Pacific for the express purpose of supplying the best passenger service yet attained between the United States, Japan, and the East. This vessel will engage in express service between San Francisco and Yokohama with connections at Yokohama for Hongkong and Manila, and stops both ways at Honolulu.

By confining the service of the larger and faster ships to the Yokohama-San Francisco run, and allowing the service between Hongkong and Yokohama to be taken over by other lines and smaller ships, the available tonnage across the Pacific will be materially increased.

"The new vessel," says Consul General Anderson, "is to have a length of 636 feet, about 46 feet longer than the *Empress* ships of the Canadian Pacific Ocean service, which now furnishes the fast service across the Pacific. The ship will have a speed of 23 knots, accommodations for 300 first-class passengers, 100 second-class, and 800 steerage passengers, and every possible convenience and luxury. It will compete with the Canadian Pacific and any ships American companies may place on the Pacific. It will be followed by other ships of the *Empress* class.

"The inauguration of the express system from Yokohama to San Francisco emphasizes the policy of the Japanese lines, under government subsidy, to serve Japanese interests first, leaving Manila and Hongkong interests and American trade there to be taken care of by other means.

"The fast service will be of special advantage to Japanese silk interests, since the short voyage reduces interest charges on valuable silk cargoes to a minimum. Inasmuch as Japanese silk interests in the last few years have developed almost a complete monopoly of the raw silk trade with the United States, this fast service is likely to increase materially the hold of the Japanese silk dealers upon American manufacturing interests.

"It is becoming more and more evident that if there is to be any material improvement in the shipping service between the United States, Hongkong and Manila, it must be from American sources.

"The keenest sort of competition in passenger and freight service on the Pacific is expected at the close of the war, and the character of the vessels already in service or under construction is such that only those of the highest class may hope to have a reasonable part in the trade."—*N. Y. Times*, 5/10.

MISCELLANEOUS NOTES

THE PANAMA CANAL.—The acquisition by the United States of the right to build a second isthmian canal in Nicaragua seems to be accepted abroad as an admission that the Panama project is a failure. A director of the North German Lloyd Company is quoted as saying that he fears the present canal may prove too unreliable a route to permit the United States to base thereon its entire international and naval policy and considers that should his prediction prove true America must choose promptly between the alternatives of building a second fleet for service in the Pacific or constructing a "perfectly and permanently reliable canal." *Page's Engineering Weekly* (London) calls the Panama Canal "a gigantic example of engineering skill misapplied under political direction" and asserts that the slides will never be brought under control and that the canal can never be relied upon to pass the fleet from ocean to ocean. There is in these articles and in others from foreign sources a general agreement that commercial use of the canal is secondary to the needs of the fleet. The pessimistic foreign opinion is of course echoed in this country to some extent but General Goethals and the National Academy of Sciences vigorously deny the charge that the slides are a permanent danger. A committee of the Academy of Sciences has completed a thorough examination of the waterway and reports that, while more trouble from slides may be expected, they will eventually cease and navigation will be in no danger of serious interruption, and concludes that the canal will serve the purpose for which it was built. General Goethals gives even more emphatic assurance that the canal is a success in his annual report made public November 10. The *New York Herald* quotes the report as follows:

"The prediction that earth movements in the Panama Canal will be overcome 'finally and for all time' is reaffirmed by Major General Goethals, Governor of the Canal Zone, in his annual report, made public to-day by the War Department. This will be accomplished, General Goethals says, 'notwithstanding the calamity howlers and in spite of the disastrous predictions of the "know it alls."'

"Referring to the slides, the General says he is moved to go into the subject again only because of the many false reports that have been published.

"'Such reports are false and there is no foundation for them,' he declares, 'yet they seem to have gained credence, probably because a pending treaty between and United States and Nicaragua contemplates securing from the latter all rights for building a canal on its territory.'

"'Such reports,' General Goethals adds, 'serve to aid shipping companies to take advantage of present conditions to charter vessels at excessive rates and permit an increase in insurance rates.' He protests particularly against a widely published report made by Professor Benjamin Leroy Miller, of Lehigh University, on his return to the United States after passing three or four hours looking over the canal. General Goethals says Professor Miller's statements were 'erroneous, unwarranted and unfair.'"

GENERAL GOETHALS ON STATUS OF THE CANAL ZONE.—Major General George W. Goethals, who was the guest of honor at a meeting of the Traffic Club at the Waldorf, said the United States should modify its treaty with Panama so that the Panama Canal zone could be made a great American commercial depot. He also said that the methods of collecting tolls should be changed for the reason that the present charges bore more heavily on American commerce than on that of Great Britain and some other nations.

"I want to see great American warehouses and shipping houses along the canal," he said, "so that it will become a great commercial station for the trade between this country and South America. In order to make it a center of commerce it is necessary that the United States shall take control over the Canal Zone after the actual building of the canal is completed."

General Goethals explained that the Taft treaty with Panama provided that jurisdiction over parts of the Canal Zone revert to the Republic of Panama when the strip of land ceased to be used strictly for canal purposes. Because the United States has only a leasehold on this part of the strip, much friction had arisen. General Goethals said, in the handling of mails and other Governmental functions, which can be done away with only by the acquisition by the United States of complete jurisdiction over the entire zone. General Goethals said that Americans would not invest their money in Canal Zone property, build homes there, or erect structures, unless they were certain that they would continue to be wholly under the jurisdiction of the United States.

"I want to see the whole thing in the hands of the United States and run as a business proposition, without any politics," he said.

Another thing that the United States ought to do, General Goethals said, was to charge tolls on the earning capacity of vessels instead of on registered net tonnage.

"Under the present system," he said, "we are in effect charging higher rates to American ships than we are to ships of other nations, particularly the British."

Under the plan of collecting on registered net tonnage, only the freight carried under decks pays toll. This plan, General Goethals said, is circumvented at the Panama Canal, as it has been at the Suez Canal, by British ships constructed to carry heavy cargoes on deck. American ships and those of all other nations would be treated equally, General Goethals said, if they were required to pay tolls according to their ability to produce revenue, which could be easily and simply measured.

"Under the plan of collecting toll according to the earning power of the ship," he continued, "we would soon have the Panama Canal paying interest on the money invested."—*N. Y. Times*, 1/11.

SUEZ CANAL INCREASES TOLLS.—Official announcement is made of an increase in the tolls on shipping going through the Suez Canal, whose board of directors has decided that from October 5, 1916, the transit dues will be increased from 6f. 75c. to 7f. 25c. per ton for loaded ships, and from 4f. 25c. to 4f. 75c. for ships in ballast. This is the second increase on dues since the war began. One of 50 centimes was instituted April 1 last. For the three months since then this increased charge has brought a revenue of about 1,500,000f. But this is only about enough to pay the difference in price which the canal has to pay for coal, not counting the other increased expenses it has to meet and the big drop in receipts from shipping. Where the Canal Company paid 35s. a ton for its coal before the war, it now has to pay £7 a ton, an increase of £300,000 on the year's coal bill. On the year's working this increase absorbs the whole of the 50 centimes increase on dues.—*Shipping Illustrated*, 30/9.

THE STEEL SITUATION.—The war has caused an unusual demand for American steel in Europe which, added to the ever increasing demands of our shipyards and car shops, threatens a temporary shortage. Announcements are made of recent orders from the allied governments for 500,000 tons of shell steel, and steel forgings, and there are other export contracts under negotiation for several hundred thousand tons of iron and steel. The United States Steel Corporation is said to be producing some 2,000,000 tons of rolled and finished steel a month for the foreign trade with about 10,000,000 tons still on order. The *New York Herald* of November 13 says that this corporation is booking orders for rolled products 33⅓ per cent in excess of full mill capacity, and trade journals fear that the winter decrease in ore supply may have serious consequences, the usual excess in the summer supply having been little more than sufficient for the immediate needs of the mills. Japanese shipbuilders, who have bought about 75,000 tons of American ship steel since the war began, are now said to be dis-

cussing contracts for new ships with the provision that the purchaser must supply the steel, and there seems to be a general hesitancy both here and abroad to accept orders for new ships in the face of the uncertainty in price and supply of materials. The *Army and Navy Journal* and *Shipping Illustrated* give assurance, however, that American steel mills will supply all necessary material for naval vessels, even if it becomes necessary to set aside commercial contracts to do so. Prices to the government will undoubtedly be high, contracts let in October for structural steel for two auxilary vessels to be built in government yards indicating an advance of about 33% since last December.

MEANING OF THE WORD "MARU."—Japanese vessels have become such frequent visitors to these shores that now more than ever the question is asked: What does the word "Maru" signify, which is a component of the name of every Japanese merchantman? We have been favored with an explanation of this riddle by a Japanese shipping friend and this gentleman's statement is submitted below for the benefit of our readers:

The word "Maru" as used to name vessels, viz., "*Tokai Maru*" (Eastern Ocean), owes its origin to an obscure analogy based upon the confusion of archaic terms which ceased to have a meaning, although their use outlasted their original utility. "Maru" means round and in olden times other things besides ships carried the suffix "Maru," such as swords musical instruments, parts of armor, dogs, hawks and the rotund extremity of castles. The probability, therefore, is that two distinct words, "Maru" and "Maro" became confused and used as one. To name sections of a castle "Maru" or "round" was natural. The word "Maro," on the other hand, is an archaic term of endearment, used in connection with such ancient proper names as Tamura Maro, a great general who subdued an army; Abe No Naka Maro, an eminent scholar of the eighth century; Okina Maro, a favorite dog of the Emperor Ichijo. The oarsman's boat naturally came to be distinguished by the same half-personal name, as the English-speaking sailor or engineer calls his ship or locomotive a "she." When the ancient word "Maro" ceased to be understood, it easily changed into the familiar "Maru" by the corruption of the final vowel "o" into "u," which is common enough in Japanese. It should be observed that "Maru" is applied to merchant vessels only. Men-of-war take the suffix "Kan" instead, as "Fuji Kan," "Asama Kan," names of mountains. "Kan" was originally a Chinese word meaning a war vessel. It is now pronounced "Lan" in the Chinese language and is no longer used in the same sense.—*Shipping Illustrated*, 4/11.

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NOTE.—Lack of space limits the scope of these references. Upon application, members of the Institute will be suplied with fuller references to current periodicals published in both the United States and foreign countries.

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1. NORTH AMERICAN REVIEW. **October.**—Sea Rights and Sea Power, by *Ed. S. Corbin.*

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4. WORLD'S WORK. **November.**—Shall We Adopt Universal Military Service? by *Chas. W. Eliot.* A New Epoch in Our Military and Naval Air Service, by *Frank C. Page.*

5. JOURNAL OF THE MILITARY SERVICE INSTITUTION. **November-December.**—U. S. Disciplinary Barracks, by *Captain Kerrick.* The Battle of the Somme (translated). Notes on Captured German Documents (translated).

6. JOURNAL OF THE FRANKLIN INSTITUTE. **November.**—Radio Stations at Nauen and Eilvese.

7. ENGINEERING MAGAZINE. **September.**—Mobilizing Our National Resources, by *H. E. Coffin.* Preparing Our Industries for the Coming Test, by *E. N. Hurley.* What is Preparedness? by *H. L. Gantt.*

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16. EDINBURGH REVIEW. **October.**—Siege by Water (Review of Int. Law), by *L. Cope Cornford*.

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Prepared by Lieutenant R. S. Edwards, U. S. Navy

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THE BATTLE OF JUTLAND

CAPTAIN SIMS' CRITICISM AND MR. POLLEN'S REPLY

Captain Sims, shortly after the newspaper accounts of the battle of Jutland were published, reported to the Navy Department as follows. The quotation is taken from the *New York Herald:*

"I have read carefully the American press accounts of the action, also a considerable number of clippings received from England which give a much fuller account. The latter includes two comprehensive articles published in *Land and Water* by Pollen, the well-known naval critic.

"I consider all these accounts distinctly on the defensive as attempts to justify the attack of a superior force (German battleships) by a greatly inferior force (British battle cruisers). As Mr. Pollen indicates, the accounts are published under the control of the censor. For example, the Admiralty permitted Mr. Pollen to make certain purely negative statements concerning the causes of the sinking of the battle cruisers, but declines for the present to publish the real cause. This is a common procedure while war is in progress. For the same period, that is to avoid the loss of prestige, even radical mistakes in tactics may be defended.

"For the above reasons it may be quite possible that certain essential features of this battle are being suppressed, these reasons being both military and political. In view of this possible and even probable condition any opinions regarding the action should be considered only with extreme reservation.

"This reservation being clearly understood, the following comments are submitted, based only upon the known essential facts:

"(a) Referring to Mr. Pollen's article and particularly to the diagram illustrating the relative positions of the British main body and battle cruisers, and the German main body and their battle cruisers of the two

sides, it will be noted that the situation was typical of that considered most probable in our war games on the sea and on the game board, in the opening phases of a sea battle between large forces.

"(b) Assuming the above forces in the relative positions indicated and considering the marked superiority of the British in numbers of all the different types and assuming the British forces to have executed (in the circumstances) very simple maneuvers necessary to concentrate their forces and strike with all their power, there can be no possible doubt as to what the result would have been. Considering the great superiority of the British, both in numbers and in power, one of two things must have happened:

"(1) Either the German main fleet would have been decisively defeated, or

"(2) It would have declined decisive action by retreating behind its defences, and even the latter would have inflicted upon the Germans a humiliation impossible to conceal, much less to claim as a victory for the encouragement of their people. The latter (forcing the German fleet to retreat before a concentrated superior force), could have been accomplished with little or no material loss, and if the Germans had elected to fight a devisive action there could be no doubt that both their proportionate and actual losses would have been vastly greater than those of the British. Also, in either case, the various types of vessels, including battle cruisers, would have been employed to the best advantage in the legitimate rôles for which they were designed.

"(c) The contention of British writers that the sacrifice of the battle cruiser squadron in fighting a delaying action against battleships, late in the afternoon, was justified in the hope of bringing on a general action between the main fleets, is not believed to be sound, and this for the simple reason that the military situation did not require the British fleet to fight a decisive action, or any action at all, because they already had practically as complete control of the sea as would have resulted from the defeat of the enemy fleet. Control of the sea is accomplished when the enemy fleet is defeated or 'contained,' and the German fleet had been 'contained' since the beginning of the war, is now 'contained,' and doubtless will remain so.

"(d) There is no reason to believe that the Germans have ever intended to risk their fleet in a decisive action against the greatly superior British fleet. They are not in the habit of pitting any military force against twice its numbers of at least equally powerful units. There is, on the contrary, every reason to believe that the Germans knew exactly what they intended to do during this last sortie of the grand fleet, and it is a reasonable presumption that they accomplished what they intended—namely, the trapping and pounding of the British battle cruisers before they could be supported by the British main body.

"(e) The surprise to naval critics, and doubtless to the Germans, was the extraordinary resistance battle cruisers can sustain and the extraordinary amount of damage they can inflict, even against battleships. This indicates a greatly enhanced value when they are employed in their proper rôle in a general naval engagement; that is, with their enfilading fire as fast wings, their driving power on the scouting lines, their support of destroyer attacks, etc.

"(f) That the British attacked battleships with battle cruisers and armored cruisers is their own affair. They doubtless had what they considered sufficient reasons for doing so, but we rest assured that this was done with the full knowledge of the probable nature of the sacrifice and not with the idea that these vessels are a match for battleships, and if the conditions as to visibility had been better the sacrifice might well have been justified by success in engaging with the German main fleet. At all events, battle cruisers proved that in case of necessity they can

fight a delaying action against battleships with reasonable chances of success.

"(g) There is nothing, however, in the incidents of the fight to justify any argument against the necessity of battle cruisers. When for any reason they are deliberately put against battleships they must expect to suffer in proportion to the relatively small number of their guns and the relative lightness of their armor. It is the same with all other types of vessels. If in this battle it had been considered necessary to launch flotillas of unsupported destroyers against the enemy's battleships in daylight and half of them had been destroyed, there doubtless would have been some arguments in opposition to building any more destroyers, and these arguments would have been precisely as sound as the popular arguments now current as a result of the sinking of the three British battle cruisers.

"(h) Beyond the demonstration of the unexpected resistance of the battle cruisers the incidents of the action in question have no bearing upon the arguments advanced in my hearing as to the immediate necessity of the addition of battle cruisers to the United States Navy in its present condition. That the battleships must constitute the main strength of a naval force admits of no doubt; but, as I attempted to show by my testimony, an adequate force of battle cruisers is necessary in order that the battleships may be used against an enemy with their maximum power. This is particularly true of the situation that would confront us in case of the necessity of repelling the attack of an enemy fleet against our coast.

"WILLIAM S. SIMS."

To this Mr. Arthur Pollen, writing in *Land and Water*, replied as follows:

On August 17th, *Land and Water* published the text of a report on the Battle of Jutland addressed to the American Secretary of the Navy, by Captain W. S. Sims—probably the most distinguished officer of his standing in the United States Service. Apart altogether from the reputation of the writer, the document is interesting as the first critique of the engagement that has come to us from a member of a neutral navy. Coming from Captain Sims, a recognized authority on naval gunnery, the report is of peculiar interest, so that the validity of his criticisms are well worth discussion.

Briefly, his points are as follows: Assuming, he says, that the initial position of the fleets was as I gave them in *Land and Water* of June 8, it was quite easy for the British force to have concentrated and then struck with the whole of its power. Had it done so the German fleet must either have submitted to the humiliation of flight or to destruction. Either would have suited the British book, and had there been a battle there would have been no occasion to use battle cruisers for any except their proper rôle. The contention of British apologists that the battle cruisers were rightly sacrificed in an engagement with ships far more powerful than themselves in order to bring on a fleet action is an unsound argument, because the military situation did not demand one. Great Britain's control of the sea was absolute and must have remained so whether the action was fought or not. There is no reason to suppose that the Germans wanted a decisive action; their only object was to trap and pound the battle cruisers fleet, and this they got the chance of doing. But they only got it because Sir David Beatty gave them the opportunity, fully knowing that he was risking his squadron in sending them against battleships, no doubt thinking he had a just excuse for the sacrifice. There is nothing in all this he says, to justify any argument against battle cruisers, whose real rôle is to drive in the scouting line to support destroyer attacks, and so forth. It is no more an argument against battle cruisers that three were lost when they were improperly used in fighting battleships, than it would be an argument against destroyers,

had these in the same action been sent unsupported against battleships in broad daylight and half of them been destroyed.

This, it seems to me, is a fair summary of Captain Sims's argument.

But it would be hardly fair to Captain Sims to enter on this discussion without first making two points clear to to reader. To begin with, the report was written before the despatches were published. The writer then had as a basis of his criticism nothing but newspaper reports and these contradictory. He was thus left free to adopt whichever version of the facts suited him best. Next, he had extremely good reasons for choosing a particular version. Indeed, it would not be going too far to say that he was compelled to accept the one he chose. For the occasion of the report was an official enquiry asking Captain Sims whether the loss of these cruisers had caused him to modify his urgent request to the House Committee to include some units of this type in the new American program. It is evident that the opponents of battle cruisers had made a great point—in the American press particularly—that it was the thinness of their armor that accounted for the British loss of ships that had cost £6,000,000 sterling, and took with them to the bottom the best part of 3000 men. Captain Sims then, not only had to defend the battle cruiser as a type, but he had to defend it from the accusation of having failed as a warship in action. As he remained as strong an advocate of battle cruisers as ever, he, having rival versions of the facts, chose the one that was thrust upon his notice and gave him the easiest reply. What could have been more convenient for his case than to brush the whole accusation aside and explain the loss of these cruisers away by the one argument that would be convincing to his auditors? He virtually says, therefore, that Sir David Beatty, in bringing lightly protected battle cruisers into action against more heavily gunned and better protected battleships, was putting the battle cruisers to a use for which ships of this kind were not intended.

As everyone now knows, there is not a tittle of evidence to support this theory. The facts correctly stated in *Land and Water* on June 8 make it altogether untenable. None of the battle cruisers lost fell in an engagement with battleships. *Indefatigable* and *Queen Mary* sank in the course of the first phase of the action when Beatty, with his six battle cruisers, was engaging von Hipper with five.

The action began first, between ships of a similar class; next, with the British with a 20 per cent superiority in numbers. After the two ships were lost, the British were inferior by 20 per cent in numbers, but in spite of this the British gun power, as measured by the weight of broadsides, remained the greater. Nor was this all, for before *Queen Mary* sank the German fire had become slower and had depreciated altogether in accuracy. In addition to greater material force, then, it is certain that our guns were shooting at a higher rate and with far greater efficiency. To make the picture complete, let us also remember that the fifth battle squadron was firing at von Hipper's rear with their 15-inch guns, though the range was too great for this fire to be very effective. As to two out of three of the battle cruisers, then, it is quite clear that they were not sunk through any indefensible exposure to ships with which they could not engage on an equality.

Invincible was lost in rather different circumstances. She came into action, in company with *Indomitable* and *Inflexible*, some time after 6.21, while the grand fleet was still deploying to the north and Sir David Beatty was driving at full speed due east to clear out of its way. His object was to get ahead of the German squadron and to throw the leading ships into confusion so as to make Sir John Jellicoe's task easier. Precisely when he was wanted, Admiral Hood brought the third battle squadron to reinforce the vice-admiral. The whole of the seven battle cruisers closed down on the German line to within 8000 yards and, as shown in Sir David Beatty's despatch, crumpled it up. Here again the fire superiority was entirely on the English side. *Invincible's* salvos were falling on the German ships and

had turned one—*Lutzow*, which, admittedly, sank—clean out of the line. She was entirely unhurt herself till, just as in the case of her consorts, a chance shell hit her. It is not quite clear from the despatches whether it was possible that this shell was fired from a German battleship. But it looks as if three of von Hipper's battle cruisers were still leading the line, and if this is so, it was more probably a round from one of these that finished her.

The point to remember is this. It so happened that three battle cruisers paid the penalty. It was extraordinary that it should have happened three times. But had the battleships been in as close action and under as effective fire, for the same period, it was a thing that might just as well have happened to any three of them as to these three lightly armored ships, because the armor had nothing whatever to do with it.

With the facts rightly viewed the whole of the Sims argument naturally tumbles down. But the report contains certain incidental arguments well worth examination, apart from the merits of the case it was written to support. The most interesting of these is the contention that we had no occasion on May 31 to risk any ships in the endeavor to force an action in which the German fleet could be destroyed. Captain Sims is, of course, on impregnable ground when he says that, for purposes of the general command of the sea, a fleet that is contained is as innocuous as a fleet that is defeated. But this is not the whole truth of the matter. A little examination will show us that there were other objects to be sought beyond the general command of the sea. There was first the moral of the enemy to be considered which, if the general expert diagnosis of the military position that was likely to be characteristic of the third year of the war was correct, was bound to be a factor of such vast importance as to make it quite indistinguishable from any other military object. Next the military situation, demanding as it did the maintenance of our armies abroad and the supply of ourselves and our Allies with food, raw material, and manufactures from oversea, supplied a strong argument for victory. And, finally, there were direct economic advantages to be obtained by the sinking of the German fleet, that were anything but negligible themselves and were certainly of enormous import in a war that must strain all Allied resources to the utmost.

The relative naval strength in the spring of this year was not such as to afford the Germans the slightest hope for decisive victory if a fleet action were fought with Sir John Jellicoe, nor was there any military advantage to be gained by a temporary control of a passage through the North Sea, such as might conceivably have been won had a portion of the British fleet been defeated. There was then no military reason for the Germans seeking an action. But as we have just seen it is not always purely military reasons that count. Two forces were continuously driving the German seamen to fight. We are not flattering our enemy in supposing that the admirals and officers who commanded the second largest fleet in the world must have had a burning desire to justify their existence. We may be quite sure that the higher command not only saw a good use, but an absolute necessity, for any form of naval activity that could be interpreted as a victory. For, that the Allies were about to strike and strike hard, must in May last have been exceedingly clear.

It can hardly have been less clear that the Central Powers would be in no condition to hit back effectively. Germany and Austria must have known that, in the military sense, it would be the beginning of the end. The only hope was to postpone the end until the resolution of the Allies would weaken, and postponement in turn would depend upon the moral of the German people. Perhaps our best grounds for expecting a collapse of Germany to come before the strictly military defeat is achieved is, that the German Government has never trusted its subjects with the truth. From the first they have been fed with the promise and the assurance of victory. But when tales of decisive triumph are not followed by their

normal consequences, when the defeated enemy, far from inclining towards the discussion of honorable peace, shows an unlimited capacity to fight on, and what is worse, to starve their conquerors, it is little wonder if discontent arises. Was it not clearly a situation in which a new sort of victory altogether was wanted? Had not the German higher command the strongest of all motives for asking the navy to supply it?

The navy was willing to oblige for two reasons. We can well believe in the first place that their wish to fight was ardent, but we know also that they were quite confident that they possessed the secret of fighting on principles of limited liability. Their experience probably was, that it was the British battle cruisers that were normally nearest to the German bases. They knew for a certainty that, if their fleet came out and Sir David Beatty was on the spot, he would not be slow in giving them a fight. They could not, of course, trap him, because the Germans never possessed more than five ships fast enough to keep up with him, and as Sir David Beatty had 10, and with the fifth battle squadron might have had 15, there could have been no question whatever of forcing action on him against his will. But if he engaged them it was a different matter, for the moment their fast squadron had joined up with the whole of the German fleet, Beatty would have to fly for his life, and then what a story the Germans would have of having driven the British fleet across the German Ocean! As to the grand fleet, Zeppelins, of course, would warn them if it was clear, and if it was misty the smoke screens and torpedo attacks would do for the German fleet, as a whole, what they had done for von Hipper's squadron in the Dogger Bank affair.

Thus the policy of the higher command, the natural desire for action of the German seamen, and their confidence that their defensive and evasive tactics, by guaranteeing them against defeat would ensure their having a story of victory, combined to make the naval sortie of May 30 anything but a harebrained proceeding. Now is it not clear that you have only got to state that the German fleet and the German higher command had an object of enormous importance to them in coming out, to prove that our fleet must at almost all costs prevent their achieving it? If their object was only to raise German moral, would it not have been worth a great sacrifice to achieve its correlative depression? Is there any train of reasoning by which you can distinguish this from any other clear demand of the general military situation? Obviously, if the length of the war depends on the courage and confidence, and hence the capacity to endure privation of the German people, is it not a very vital matter indeed to make quite clear to them by every means in our power, that their courage is wasted, their prospects hopeless, and their voluntarily endured hardship doomed to be without reward? On this ground alone then it seems to me that Captain Sims, in saying that the military position did not call for a decisive victory, while possibly correct if judged by text book standards, was lamentably out if we judge him by the realities of war.

One of the things that more than anything else has puzzled lay students of the naval side of the war, is the precise reason why British warships cannot enter the Sound nor German warships the Channel. They know generally that narrow waters can be mined and clearly lend themselves to effective defence by submarines and destroyers. But they also know that mines are not an absolute bar to the progress of a fleet, for the simple reason that they can be removed; and that a fleet, adequately protected by light craft, can face torpedo attack, whether from the surface or from below, with a reasonable chance of protecting itself altogether. Why then, they ask, should we regard the Sound and the Germans the Channel as waters that cannot be entered? The answer is, that the best defence that a fleet has against torpedo attack is its speed. Capital ships cannot hang about where destroyers can attack them from under cover of the land or submarines from the unseen depths. If, then, a mine field has to be removed, which can only be done by sweeping, and even with the best

appliances is not a very rapid process, the craft engaged in it must be on the spot, and finish their work before the capital ships come upon the scene to use the channel which they make. How are these craft to be protected? If they are only covered by light cruisers, the heavier ships of the enemy will come down and drive them in and then have the mine sweepers at their mercy. Their own capital ships cannot come to the rescue, except—ex-hypothesis—to fight in very disadvantageous circumstances. Thus the function of mine fields and torpedo-craft disposed for the blocking of narrow waters is not primarily the creation of an impassable physical barrier, but the establishment of an obstacle that can only be removed by a lengthy process, during which the craft engaged in it must be supported by the strongest possible naval force. They cannot be thwarted or the barrier removed without the main fleet being involved. If this is a correct analysis, the removal of the enemy's main fleets alters the problem altogether. If there were no German battleships nor battle cruisers, a passage into the Baltic could be forced and a fleet sent in adequately protected against underwater attack. The first result, then, of the total destruction of the German fleet would be that a junction between the British and Russian navies would be feasible. What would be its military value?

The left of the German line in Russia rests on the Gulf of Riga, which is 100 miles east and about 100 miles north of Memel. There is, therefore, in the rear of the Germans over 200 miles of the coast of Courland open to invasion. If the Baltic were opened, if there was no German battle fleet to interfere with the operations, transports could be loaded with men, guns, and horses at Reval and Kronstadt, and a force landed north or south of Libau. It would compel the withdrawal of the whole German line, and such a withdrawal might easily be decisive. There is no lack of men in Russia, probably no lack of shipping in Russian ports. With the Sound open, the provision of the requisite shipping would present no difficulties anyway. The point need not be argued in detail, for it is clear that if the Allied control of the Baltic were absolute, as it would be if the High Seas fleet were destroyed, there would not only be 200 miles of the Russian Courland coast open to invasion, but the best part of 500 miles of German coast as well.

When Sir Ian Hamilton's forces landed in Gallipoli, in the face of the most scientific defences conceivable, there was not wanting those who said that this was a final proof that England would be successfully invaded by Germany. But they omitted from their calculation the governing condition at Gallipoli. It was, of course, that the invading force possessed an absolute command of the sea. But they were probably right in interpreting the event to mean that if defences are military only, they cannot suffice to prevent a properly supported landing any more than the best trenches can resist penetration, if the right kind of force in adequate quantity is brought against them. And at Gallipoli the landing was attempted at a very limited number of points, and those made as impregnable as the engineering and artillery skill of the enemy could make them. Any such preparations would be impossible over the *whole* of the many hundred miles of Germany's Baltic coast. The first, therefore, and the most obvious of the military advantages that the *complete* destruction of the German fleet would make possible, would be an Anglo-Russian invasion from the Baltic.

But, just as mine fields, torpedo defences and so forth, cannot be overcome except by the ultimate backing of overwhelming naval force, so, conversely, if there is no very formidable naval force at the disposal of the enemy, mine fields and barriers can be pushed into his own immediate neighborhood. In other words, instead of maintaining, as we now do, a long-range blockade of Germany, we could, if no German fleet existed, establish a short range blockade. Instead of mining them *out* of the Channel, we could mine the Germans *into* their own harbors. Instead of

netting their submarines out of our waters, we could net and blockade them into their own. We cannot do so now because the establishment of barriers of this kind is the work of small craft, because it takes time, and because it has to be done by ships, either largely stationary or moving very slowly. It has to be done by ships that cannot protect themselves while they are doing it. But if there was no fear of their being attacked by very formidable units, the problem of protecting them would be reduced to very simple proportions indeed. There would thus follow, from the final and complete destruction of the German battle fleet, the possibility of relieving British and Allied shipping from the formidable toll which the German submarines take. And that this toll is, in spite of American protests and of German promises, both intrinsically heavy and taken without the least scruple as to safeguarding the lives of passengers and crew, is unfortunately still the most disconcerting feature of the naval position. To be almost altogether quit of it, would then, be an enormous relief to the whole Allied undertaking, which, it must never be forgotten, rests solely on the sea service that British naval supremacy guarantees.

But this again does not exhaust the case, for, for nearly two years now, the whole resources of the British shipbuilding industry, together with a large proportion of the steel makers' capacity, has been devoted—and quite necessarily devoted—to building battleships, battle cruisers, fast light cruisers, destroyers, patrol boats, and auxiliaries, for the Royal Navy. The total shipbuilding capacity of the country has in past years shown itself to be equal to producing a million and a quarter tons of merchant shipping and over a quarter of a million tons of war shipping per annum. At war pressure, if the navy had no requirements at all, it could probably produce something between 180,000 and 200,000 tons of merchant shipping per month. It is only the continued existence of the High Seas fleet, and the continued liberty of the German submarines, that makes it necessary for the Tyne and the Clyde to work almost exclusively for the Royal Navy. If the High Seas fleet were sunk and the submarines restrained, the merchant ship losses both of the Allies and of the neutrals, could be made good by British builders in less than a year.

The reader may think that I am disputing Captain Sims' critism with quite unnecessary particularity. The gallant captain had this criticism forced from him, not as a considered judgment on British strategy, but as incidental to his defence of the type of ship that he wanted Congress to include in the naval program. But I have pursued the subject for this reason. This chance observation of Captain Sims illustrates better than anything I can remember the astonishing difference between the point of view of those who only talk and reason about war, and of those who are faced by its realities. It was our own fate before the war to have our naval policy limited by civilian comprehension of our necessities. Such naval officers as were consulted had to limit their arguments to the considerations politicians would understand. Is Captain Sims' report evidence that America is still in the same condition?

Frankly, I find it impossible to believe that Captain Sims had he been addressing a professional audience, would have used these arguments. For had he given any weight to the very obvious considerations which I have set out above, so far from saying that Sir David Beatty was not justified in risking the battle cruiser fleet to bring on a decisive action—the charge is, as we have seen, quite unfounded, but let that pass for the moment—he would, I think, have gone with me in saying that, could the destruction of the whole battle cruiser fleet have *ensured* the total destruction of the German Navy, it would have been Sir David Beatty's obvious duty to take the risk. And I am borne out in thinking this by one of Captain Sims' own phrases. "When for any reason," he writes "they (battle cruisers) are deliberately put against battleships, they must expect to suffer in proportion to the relatively small number of their guns and the relative light-

ness of their armor. It is the same with all other types of vessels. If in this battle it had been considered necessary to launch *flotillas of unsupported destroyers against the enemy's battleships in daylight*, and half of them had been destroyed, there would doubtless have been some arguments in opposition to building any more destroyers—and *these arguments would have been precisely as sound as the popular arguments* now current as a result of the sinking of the British battle cruisers." Here, it seems to me, speaks the real sailor. Because, in this very battle of Jutland, destroyers were launched, unsupported and against battleships, in broad daylight, and it was done by both sides again and again, a certain number of destroyers were lost. But no one squealed about the "rash impetuosity" of those who risked unarmoured destroyers against big guns, a single shot of which could blast them into scrap iron. And the result has not been made the occasion for decrying the building of destroyers, but an excuse for building more!

In the end, then, I find myself in exact agreement with Captain Sims. Destroyers—like all other forms of warships—have to be risked at times in unsupported attacks on vessels vastly more powerful than themselves. And when this occurs, such ships must at times be lost. We must not forget, however, that this is their destiny. And whether it is the two-and-a-half million pound battle cruiser, or the destroyer that represents less than a tenth of its value, the principle is the same.

"ARTHUR POLLEN."

ATLANTIC OCEAN

"U-53" ON UNITED STATES COAST

The German submarine *U-53* entered Newport harbor at 2.15 p. m., October 7. Her captain made the usual official calls. The *U-53* left port at 5.30 p. m. the same day without taking on board fuel or supplies, although her captain stated that he had left Wilhelmshaven 17 days before making Newport. The next day the submarine sank five merchant ships off Nantucket, leaving their passengers and crews to be picked up by American destroyers that answered the radio calls for help. Nothing further was heard from the *U-53* until an official announcement from Berlin on the last day of October reported her safe arrival in Germany. In commenting on the occurrence the press was quick to suggest that one or more supply depots must have been available for the *U-53* on the American coast, or else that a tender disguised as a merchantman was convoying her—the question of shore bases was soon settled by a search by the destroyer force which showed none to exist.

President Wilson outlined the policy of the United States would follow in reply to a demand by the Allies that German submarines be barred from American ports, declaring that no rule of international law had been violated and that the United States reserved liberty of action in dealing with all such cases.

The mission of the *U-53* has not been made public—one theory that received wide circulation in the American press is that she convoyed the *Deutschland*, while the *Providence Journal* asserts that she was a decoy sent to test the policy of America in regard to submarine warfare. The *Journal* claims that its information is from reliable sources and adds that the *U-48* and the *U-61* accompanied the *U-53* and that all three submarines were, on October 23, still on this side of the Atlantic between Cape Henry and the West Indies.

British service papers appear to regard the issues raised by the operations of the *U-53* as mainly legal and diplomatic, and express no fear that commerce will be seriously menaced by submarine activity on this side of the Atlantic.

NORTH SEA AND CHANNEL

ZEPPELIN RAIDS ON ENGLAND

Two raids by German Zeppelins were made over England on the nights of September 23 and September 25. The British official statement reports that 38 persons were killed and 125 injured in the first raid in which "14 or 15" Zeppelins took part. Two of the raiders (*L-32* and *L-33*) were shot down by anti-aircraft guns in Essex; one fell in flames and was destroyed together with its crew, while the crew of the other were unhurt and gave themselves up as prisoners to a village constable. A description of the *L-33* is given in this issue of the PROCEEDINGS under the heading "Aeronautics." The second raid was made by a weaker force—only seven airships according to British accounts. The Germans claim that much damage was inflicted on the naval base at Portsmouth and on military establishments at other places, but England denies serious damage of military importance. The raiders were not injured. On October 10 ten Zeppelins took part in a raid, two of them reaching London where one was promptly shot down.

ACTIVITY OF SEAPLANES

Seaplanes of all the belligerents have been very active, both over land and over water. Germany has used them to raid the English coast, while the Allies have made many aerial attacks on Zeppelin sheds and German military establishments. The details of these operations are bewildering in their multitude and any military advantage gained by their use has been so well concealed that it is impossible to arrive at any conclusion as to the value of the results attained. The *New York Herald* says that England is now using seaplanes as convoys for merchant vessels, giving as an example the statement of several passengers on a Danish vessel that the ship was accompanied for about 25 miles after leaving Kirkwall by an armed airplane.

DESTROYER OPERATIONS

A channel raid by German destroyers on October 26 is thus described in an official communication from Berlin published in the *New York Times:*

"Parts of our torpedo forces moved from a German bay through the straits of Dover and Calais to the line of Folkestone-Boulogne in the English Channel.

"According to the report of Commander Michelson, at least 11 outpost steamers and two or three destroyers or torpedo boats were sunk partially or totally near hostile ports. Some members of the crews who were saved were captured.

"Several other guarding vessels, and at least two destroyers, were heavily damaged by torpedoes and artillery fire. Also the English post steamer *Queen* was sunk south of Folkestone, the crew having time to leave the ship. In the Channel, near the Ferne Lightship, there was a strikingly active traffic by hospital ships.

"Our torpedo boats safely returned to German waters without any loss."

The British statements admit the loss of the empty transport *Queen*, the destroyer *Flirt*, and six drift net boats, while the destroyer *Nubian* was torpedoed and later ran aground. Mr. Balfour stated in the House of Commons that "there is ground for thinking that two German destroyers, after being hit during the action, struck mines and were blown up and probably sunk." British dispatches state that 10 German destroyers took part in the raid but make no mention of the strength of their own forces.

This raid was repeated a week later, a Berlin dispatch to the *New York Times* quoting the Admiralty statement in substance as follows:

"On the night of November 1-2 small German naval vessels advanced from points of support on the coast of Flanders against the trade routes between the Thames and Holland. They stopped and searched several

steamers and brought two of them, which were suspicious, into port. A third steamer which was ordered to follow has not arrived.

"As they were returning, some of our torpedo boats were shelled for a brief time without success by four British cruisers. Our naval forces all returned safely."

SUBMARINES

German submarines continue to operate with some success against merchant vessels and England continues to keep silent in regard to her operations against submarines. On October 13 a German submarine sank the Roumanian ammunition ship *Bistrita*, a vessel of 3683 tons, and on the 23d an English vessel was torpedoed—an old cruiser according to German accounts; London states that it was the mine sweeper *Genista*. Berlin reports that on November 4 the *U-20* grounded on the coast of Jutland in a fog and was blown up by her crew when efforts to float her failed.

A British submarine on October 19 torpedoed the German light cruiser *Muenchen* which returned to port, slightly damaged Berlin says. London also reports that a German dreadnought was hit by a torpedo from a submarine near the Danish coast on November 5; confirmation is lacking.

BALTIC SEA AND THE ARCTIC OCEAN

The *New York Times* publishes an unconfirmed report that the Russian battleship *Sevastopol* struck a mine on October 28 and was badly damaged. Other reports from the Baltic refer to seaplane raids by both Russia and Germany with no unusual results except the unconfirmed statement that a Russian destroyer was sunk by airplane bombs in the Gulf of Riga.

Press dispatches state that a German submarine has made its way into the Artic Ocean and has torpedoed three Norwegian merchantmen there, the probable purpose being, according to the *New York Times*, to interfere with the transportation of war materials to Russia by way of the White Sea ports.

The Gulf of Finland has of late become prominent in the news of the war. There a Russian armored cruiser, either the *Rurik* of the *Gromobol*, has run aground, with the possibility of salvage doubtful, according to an unconfirmed dispatch to the *Associated Press* from Berlin; and on November 10 German destroyers made a determined raid on a Russian naval base on the shore of the gulf. The official statements in regard to the raid are as follows, according to the *New York Herald:* PETROGRAD.

"On Friday night a flotilla of the enemy's 36-knot torpedo craft entered the Bay of Finland. A dense fog hindered discovery of the enemy's vessels in good time and in consequence the enemy succeeded in bombarding the Baltic coast for several minutes. About 100 shells, mostly shrapnel, were fired. Seven civilians, including five children, and two rank and file were killed. One woman and four soldiers were wounded. Several houses were damaged and 12 horses were killed.

"The enemy retired hurriedly, but we sank a majority of the torpedo craft. Further pursuit of hostile units was abandoned in consequence of dense fog and the timely discovery of the enemy's traps."

BERLIN.—"Prussian torpedo-boat forces on Friday night entered the Gulf of Finland and effectively shelled the Russian naval base of Baltic Port at short range, according to an official statement issued to-day at the German Admiralty."

Baltic Port is near the entrance to the Gulf of Finland, 38 miles west of the Russian naval station of Reval. The port is the terminus of the Baltic railroads.

A later dispatch from Petrograd announces that between six and nine German destroyers were sunk.

THE MEDITERRANEAN

The most interesting event in the Mediterranean within the past two months was the seizure of the Greek Fleet by the Allies. What actually occurred seems to be somewhat of a mystery, but it is evident that the Salonica expedition feared to leave the uncertain power of the Greek fleet in its rear and so in some way got possession of the vessels. The *New York Herald* reported on September 29 that the battleship *Hydra* and two torpedo-boats had voluntarily joined the Allies' fleet. By October 11 practically all the remainder of the Greek Navy was in the possession of the Allies. The Greek crews were landed and sent to Athens. No opposition apparantly was offered by Greece except a protest through diplomatic channels; indeed, some of the press reports say that many of the vessels put themselves under the protection of the Allies' fleet after a pacific munity against the Greek Government. The Arsenal at Salamis and the forts at the Piraeus are reported to be also in the possession of the Allies.

There has been much activity among sulmarines and small craft in the Mediterranean. The French submarine *Faucault* was sunk in September by Austrian seaplanes which effected a gallant rescue of the submarine's crew. On October 4 a submarine sank the French transport *Gallia* with 2000 French and Serbian soldiers on board, most of whom were saved by a cruiser and patrol boats. On the same day the British transport *Franconia,* an 18,000 ton Cunard liner, was also sunk. No troops were on board. A curious account is the following from the *London Times:*

BUKAREST, Sept. 21.

The aeroplanes which arrived here from Salonika brought an interesting account of the destruction of a German submarine at Hagios Kosmos, on the coast of Attica, a few miles east of Phaleron.

After the arrival of the Allied fleet at the Piraeus the discovery of a large depot of lubricating oil on this coast was made by scouting vessels. A tube about 600 yards in length was found connecting the depot with a German submarine, which plunged immediately when detected. The tube was broken, but the portion attached to the submarine floated. Various fragments of the wreck were found two days later.

The depot, which had been constructed underground, was lined with concrete, and contained an enermous quantity of oil. It is stated to have been constructed by a Greek merchant at the Piraeus who recently acquired great wealth from unknown sources.

A Paris despatch to the *New York Times* says that a large Austrian battleship blew up in the harbor of Pola in September but the story is based on somewhat vague reports and is denied at Vienna.

TURKISH WATERS, BLACK SEA AND THE TIGRIS

The *Army and Navy Gazette* (London) in its issue of October 21 thus describes two rather unusual naval operations:

"As illustrative of a very different phase of submarine warfare, the gallant exploit of the *Tyulen,* commanded by Lieutenant Kitizin, of the Russian Navy, in the Black Sea, deserves mention. The *Tyulen* is a Russian submarine of 600 tons displacement, launched in 1913, according to the latest issue of the *Dickinson Return.* Her engines for surface work are of 2000 horse-power, giving her a speed of 15 knots, and she carries eight torpedo-tubes. The submarine was lying submerged east of Kefken Bay, on the Asiatic side of the entrance to the Bosphorus, when the *Rodosto,* an armed Turkish transport of 6000 tons, under the command of German officers, was observed steaming to the eastward. Lieutenant Kitizin took his boat within a mile of the transport and opened fire. The *Rodosto* replied with heavier guns, but after an hour's fight, during which the submarine gradually drew closer, fire broke out on board the transport, and her crew began to jump overboard. Among the men picked up by the *Tyulen* was the *Rodosto's* commander, a captain in the German Navy,

and a German chief engineer. The submarine then took off the remainder of the Turkish crew, put out the fire and repaired the damage to the prize sufficiently to enable her to proceed under her own steam. The *Tyulen* with the *Rodosto* reached Sebastopol in 40 hours. The Tsar has conferred on the commander of the submarine the Order of St. George, a similar honor to that conferred by his Majesty upon British submarine commanders for their daring and skilful work in the Baltic. This is the first recorded occasion on which a submarine has engaged in a gunnery duel with an armed ship of the enemy, and has captured and taken her into port.

"In the Kut despatches, issued last Friday, General Sir Percy Lake, in describing the operations in Mesopotamia from January to the end of April in this year, makes mention of the assistance rendered by the navy. Sir Percy Lake refers at length to the last chance there remained of relieving Kut, by attempting to supply provisions by means of the river. The *Julnar* was prepared for an attempt to run the enemy's blockade. With a naval crew, under the command of Lieutenant H. O. B. Firman, R. N., assisted by Lieutenant-Commander C. H. Cowley, R. N. V. R., this vessel, one of the fastest steamers on the river, left Falahiyah at 8 p. m. on April 24, carrying 270 tons of supplies. She was soon discovered and shelled by the enemy on her passage, and at about midnight a burst of heavy firing was heard at Magasis, some eight and a half miles from Kut by river. There the enterprise appears to have failed, and the next day the air service reported the vessel in the hands of the Turks. Both the officers reported to have been killed and the remainder of the crew, including five wounded, were made prisoners of war."

German aircraft have been active over the Black Sea and Roumania, a Zeppelin having taken part in a raid on Bucharest in September. Despatches from Sofia and Berlin to the *New York Times* say that the Russian battleship *Imperatritsa Maria* (22,500 tons, 12 12-inch guns) struck a mine near the mouth of the Danube early in November and was destroyed. It is well known that the Russian Black Sea fleet has been active in this region in cooperation with the land forces, frequent reports of bombardments of Constantza and other ports by the fleet having been published within the last month, but the despatches from Petrograd make no mention of Russian losses in the Black Sea.

TABLE OF NAVAL LOSSES OF THE VARIOUS BELLIGERENTS SINCE THE OUTBREAK OF WAR

The following table is compiled from various articles appearing in the press of the several belligerent nations. These reports are so contradictory that it is impossible to furnish an absolutely correct list of vessels lost to date. In many cases the belligerent powers have failed to acknowledge the losses of all the vessels. No attempt has been made to include herein a list of the various trawlers, mine-sweepers and such odd small craft which may have been destroyed while mine-sweeping or on submarine patrol duty.

(On the left margin of this table of losses is a reference to the whole number in which an account of the loss is given. A page index of these losses is given in the whole number referred to.

ABBREVIATIONS FOR TYPE OF VESSEL

Dreadnought battleship	d. b.	Torpedo-boat	t. b.
Battleship	b.	Submarine	sm.
Battle cruiser	b. c.	Auxiliary cruiser	ax. c.
Armored cruiser	a. c.	Transport	tr.
Protected cruiser	p. c.	Minelayer	m. l.
Cruiser	c.	Coast guard	c. g.
Light cruiser	l. c.	Hospital ship	h. s.
Gunboat	g. b.	Training ship	tr. s.
Torpedo gunboat	t. g.	Patrol boat	p. b.
Monitor	m.	Armed merchant vessel	a. m. v.
River monitor	r. m.	Yacht	y.
Flotilla leader	f. l.	Naval tender	n. t.
Destroyer	d.		

LOSSES OF GREAT BRITAIN AND HER ALLIES

BRITISH WARSHIP LOSSES

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
154, 155, 156	Audacious	d. b.	24,000	Reported sunk off Irish coast. Cause unknown. British Admiralty, non-committal	29-10-14
155	Bulwark	b.	15,000	Internal explosion at anchor in the Thames	25-11-14
156	Formidable	b.	15,000	Sunk by German sm., North Sea	1- 1-15
156	Irresistible	b.	15,000	Sunk in the Dardanelles	18- 3-15
156	Ocean	b.	12,950	Sunk in the Dardanelles	18- 3-15
161, 162	King Edward VII	b.	16,350	By mine, North Sea	9- 1-16
158	Goliath	b.	12,950	Torpedoed in Dardanelles	12- 5-15
158, 161	Triumph	b.	11,800	Sunk by sm., Dardanelles	25- 5-15
158	Majestic	b.	14,900	Sunk by sm., Dardanelles	27- 5-15
163, 164	Russel	b.	14,000	Sunk by mine, Mediterranean	26- 4-16
164	Queen Mary	b. c.	27,000	Sunk by gunfire, battle of Jutland	31- 5-16
164	Indefatigable	b. c.	18,750	Sunk by gunfire, battle of Jutland	31- 5-16
164	Invincible	b. c.	17,250	Sunk by gunfire, battle of Jutland	31- 5-16
161, 162	Natal	a. c.	13,360	Internal explosion and sunk at anchor	30-12-15
153	Warrior	a. c.	13,550	By mine	5- 9-14
154	Hogue	a. c.	12,000	Sunk by German sm. U-29, North Sea	22- 9-14
154	Cressey	a. c.	12,000	Sunk by German sm. U-29, North Sea	22- 9-14
154	Aboukir	a. c.	12,000	Sunk by German sm. U-29, North Sea	22- 9-14
154	Hawke	a. c.	7,350	Sunk by German sm. U-9, North Sea	16-10-14
154, 155	Good Hope	a. c.	14,100	Sunk by German forces in Pacific	1-11-14
154, 155	Monmouth	a. c.	9,800	Sunk by German forces in Pacific	1-11-14
160	Argyll	a. c.	10,850	Ran aground, east coast of Scotland	28-10-15
164	Defense	a. c.	14,600	Sunk by gunfire, battle of Jutland	31- 5-16
164	Black Prince	a. c.	13,550	Sunk by gunfire, battle of Jutland	31- 5-16
164	Warrior	a. c.	13,550	Sunk by gunfire, battle of Jutland	31- 5-16
164	Hampshire	p. c.	10,850	Sunk by mine, off Orkneys	6- 6-16
153, 155	Pathfinder	l. c.	2,940	Sunk by German sm., North Sea	5- 9-14
165	Falmouth	l. c.	5,250	Sunk by German sm., North Sea	19- 8-16
165	Nottingham	l. c.	5,440	Sunk by German sm., North Sea	19- 8-16
153	Amphion	l. c.	3,360	Sunk by mine, North Sea	6- 8-14
153	Pegasus	l. c.	2,135	Sunk by German c. Koenigsberg at Zanzibar	20- 9-14
162	Arethusa	l. c.	3,750	By mine off east coast of England	14- 2-16
155	Hermes	l. c.	5,600	Sunk by German sm. U-27, North Sea	30-10-14
163	Penelope	l. c.	3,600	Reported damaged beyond repair, attack on Hovestoft	25- 4-16
153	Speedy	t. g.	810	Sunk by mine, North Sea	3- 9-14
154, 155	Niger	t. g.	810	Sunk by German sm. while at anchor	11-11-14
164	M-30	m.	——	Sunk by Turkish gunfire, Gulf of Smyrna	13- 3-16
164	Tipperary	f. l.	1,850?	Sunk by gunfire, battle of Jutland	31- 5-16
164	Turbulent	f. l.	?..	——.. Sunk by gunfire, battle of Jutland	31- 5-16

BRITISH WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
	Bullfinch	d.	370	Sunk in collision with Dutch merchant ship	18- 8-14
	——	d.	——	Ran ashore, Scotch coast	27-12-14
	Erne	d.	550	Wrecked in a storm	- 2-15
157, 158	Recruit	d.	385	Sunk by German sm., North Sea	1- 5-15
157, 158	Maori	d.	1,035	Blown up by mine off Belgian coast	7- 5-15
159	Lynx	d.	935	Sunk by mine	10- 8-15
161	Louis	d.	965	Wrecked, Eastern Mediterranean	10-11-15
162	Coquette	d.	365	Sunk by mine, North Sea	?- 3-16
164	Fortune	d.	920	Sunk by gunfire, battle of Jutland	31- 5-16
164	Sparrowhawk	d.	950	Sunk by gunfire, battle of Jutland	31- 5-16
164	Ardent	d.	950	Sunk by gunfire, battle of Jutland	31- 5-16
164	Shark	d.	950	Sunk by gunfire, battle of Jutland	31- 5-16
164	Eden	d.	555	Sunk after collision, English Channel	16- 6-16
164	Nomad	d.	——	Sunk by gunfire, battle of Jutland	31- 5-16
164	Nestor	d.	——	Sunk by gunfire, battle of Jutland	31- 5-16
165	Lassoo	d.	——	Sunk, mine or torpedo, North Sea	13- 8-16
	Medusa	d.	——	Sunk in collision	?
166	Flirt	d.	360	Sunk by gunfire of German d	26-10-16
166	Nubian	d.	985	Torpedoed by German d. and ran aground	26-10-16
158	No. 10	t. b.	244	Sunk by German sm., North Sea	10- 6-15
158	No. 12	t. b.	253	Sunk by German sm., North Sea	10- 6-15
160	No. 96	t. b.	130	Sank after collision with merchantman, Straits of Gibraltar	1-11-15
162	No. 11	t. b.	253	Sunk by mine, North Sea	?- 3-16
153	AE-1	sm.	725-810	Accidentally sunk off Australian coast	14- 9-14
154	E-3	sm.	725-810	Rammed and sunk by German vessel	18-10-14
154, 155	D-5	sm.	550-600	Sunk by German mine, North Sea	3-11-14
	D-2	sm.	550-600	Reported lost. Details not known	1-12-14
	E-10	sm.	725-810	Missing, North Sea	
157	E-15	sm.	725-810	Ran aground in the Dardanelles and destroyed by own picket boats	17- 4-15
162	——	sm.	——	Stranded, Dutch coast	6- 1-16
162	E-17	sm.	725-810	Reported as sunk off Holland	6- 1-16
159, 160	AE-2	sm.	725-810	Sunk, Sea of Marmora	30- 4-15
	E-13	sm.	725-810	Sunk by German torpedo craft off Danish coast	19- 8-15
160	E-7	sm.	725-810	Sunk at Dardanelles	4- 9-15
160, 161	E-20	sm.	——	Announced as sunk by Turks in Dardanelles	5-11-15
163	E-22	sm.	——	Sunk off Holland	6- 1-16
154	Oceanic	ax. c.	17,274	Ran aground off north coast of Scotland in storm	8- 9-14
162, 163	Alcantara	ax. c.	15,300	Sunk in battle, North Sea	29- 2-16
	Rohilla	ax. c.	7,400	Ran aground off Whitby, completely wrecked	30-10-14
156	Viknor	ax. c.	5,386	Lost off Irish coast	14- 1-15
	Clan Macnaughton	ax. c.	4,985	Lost in a gale	3- 2-15
157	Bayano	ax. c.	5,948	Probably torpedoed by German sm. in Irish Sea	12- 3-15
159	Ramsey	ax. c.	——	Sunk by German ax. c. Meteor, North Sea	8- 8-15
159	India	ax. c.	7,900	Sunk by German sm., North Sea	10- 8-15
165	Duke of Albany	a. m. v.	1,977	Sunk by German sm., North Sea	24- 8-16
159	Royal Edward	tr.	11,117	Sunk by sm., Ægean Sea	14- 8-15
160	Marquette	tr.	7,057	Sunk by German sm., Ægean Sea	26-10-15
160	Ramazan	tr.	3,477	Sunk by German sm., Ægean Sea	17- 9-15
161	Woodfield	tr.	——	Sunk off coast of Morocco	30-11-15
166	Franconia	tr.	18,000	Torpedoed by German sm	4-10-16
	Hythe	aux.	201	Collision, Ægean	29-10-15
158	Princess Irene	m. l.	——	Internal explosion off Sheerness	27- 5-15
163	Medusa	m. l.	——		
161	Abbas	c. g.	298	Sunk by German sm. off Sollum Harbor, Egypt	6-11-15
161	Abdel Monaym	c. g.	598	Sunk by German sm. off Sollum Harbor.	6-11-15
161	Anglia	h. s.	1,862	Sunk by mine, English Channel	17-11-15
	Fishguard II	tr. s.	——	Foundered in gale, North Sea	17- 9-14
160, 161	Tara	p. b.	6,322	Sunk by German sm., Mediterranean	5-11-15
161	Aries	y.	——		15
161	Irene	y.	——		15

In addition to the above, the press reports that several other English submarines have been destroyed. The list above includes only those which were apparently officially announced by the British Admiralty.

FRENCH WARSHIP LOSSES

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
156	Bouvet	b.	12,007	Sunk at the Dardanelles	18- 3-15
157	Leon Gambetta	a. c.	12,352	Torpedoed by Austrian sm., Straits of Otranto	26- 4-15
162	Amiral Charnier	c.	4,702	Torepdoed, Mediterranean	8- 2-16
156	Mousquet	d.	298	Sunk by Emden at Penang	28-10-14
156	Dague	d.	720	Sunk by Austrian mine off Antivari	24- 2-15
	Branlebas	d.	330	Sunk by mine	
162	Renaudin	d.	756	Torpedoed, Adriatic	18- 3-16
164	Fourche	d.	845	Sunk by Austrian sm., St. of Otranto	26?-6-16
164	Fantassin	d.	453	Sunk incident to collision	- 6-16
	Zelée	g. b.	636	Sunk by German cruisers at Tahiti	22- 9-14
	No. 347	t. b.	97	Sunk in collision with each other	9-10-14
	No. 338	t. b.	97		
	——	t. b.	——	Reported lost	- 1-15
	No. 331	t. b.	97	Sunk in collision off Cherbourg	16- 6-15
	No. 219	t. b.	87	Sunk off Nieuport	- 1-15
155	Curie	sm.	392	Sunk by Austrians at Pola	23-12-14
156	Saphir	sm.	386- ?	Sunk at the Dardanelles	15- 1-15
	Joule	sm.	392- ?		
	Calypso	sm.	345-490	Rammed and sunk during maneuvers off Cape Lardier	8- 7-15
159	Mariotte	sm.	522-615	Sunk at the Dardanelles	20- 7-15
160	Turquoise	sm.	386- ?	Sunk in the Sea of Marmora	3-11-15
161	Fresnel	sm.	392- ?	Sunk in the Adriatic by an Austrian ship	5-12-15
166	Faucault	sm.	390	Destroyed by Austrian seaplanes	- 9-16
162	Provence	ax. c.	18,400	Torpedoed, Mediterranean	26- 2-16
	Indian	ax. c.	800	Sunk by sm. off Rhodes	8- 9-15
	Calvados	tr.	——	Sm., Mediterranean	-11-15
166	Gallia	tr.	15,000	Sunk by sm	4-10-16
158, 159	Casa Bianca	m. l.	945	Sunk in the Ægean Sea by a mine	3- 6-15
161	Monge		392- ?	Sunk by Austrians, Adriatic	28-12-15

RUSSIAN WARSHIP LOSSES

166	Imperatrista Maria	d. b.	22,500	Sunk by mine (not confirmed)	-11-16
	Pallada	a. c.	7,775	Sunk by German sm., Baltic	11-10-14
155, 156	Jemtchug	c.	3,130	Sunk by Emden, Penang	28-10-14
	Donnetz	g. b.	1,224	Sunk by Turks, Black Sea. Raised by Russians	31-10-14
	Kubanez	g. b.	1,280	Reported by Turks sunk by Turkish d.	29-10-14
159	Sivutch	g. b.	875	Sunk by Germans, Baltic Sea	20- 8-15
	Kubanetz	g. b.	1,200	By gunfire, Odessa	29-10-14
162	Leit Pushtscheen	t. b.	——	Sunk by mine, Black Sea	10- 3-16
	Putschino	t. b.	——	By gunfire	30-10-14
155	Prut	ax. c.	5,440	Scuttled to avoid capture	29-10-14
	Riasan	tr.	3,522	Captured by Emden	6- 8-14
158	Yenisei	m. l.	2,926	Sunk by German sm., Baltic	4- 6-15
	Oleg	m. l.	1,125	Sunk, Black Sea	24-12-14
	Athos	m. l.	1,743	Sunk, Black Sea	24-12-14
163	Portugal	h. s.	——		

Various German reports state that Russian men-of-war were destroyed in the several minor engagements in the Baltic. These losses were never officially announced by the Russian Admiralty.

JAPANESE WARSHIP LOSSES

	Shirotaye	d.	380	Ran ashore, Tsing Tao	4- 9-14
	No. 33	t. b.	82	Sunk by mines while mine-sweeping off Tsing Tao	11-11-14
	Name unknown	t. b.	——	By mine	
154, 156	Takachiho	tr. s.	3,700	Torpedoed by German d., S-90, off Tsing Tao	17-10-14

In addition to the above, five special service ships were sunk during the operations off Tsing Tao.

ITALIAN WARSHIP LOSSES

165	Leonardo da Vinci	d. b.	22,340	Caught fire and blew up, Taranto harbor	- 8-16
160	Benedetto Brin	b.	13,215	Sunk by internal explosion	28- 9-15
158	Amalfi	a. c.	9,958	Sunk by Austrian sm., Adriatic	7- 7-15
158	Garibaldi	a. c.	7,234	Torpedoed off Ragusa, Austrian sm.	18- 7-15
158	Turbine	d.	325	Scuttled to avoid capture after engagement with Austrian vessels, Adriatic	24- 5-15
164	Citta di Messina	ax. c.	3,495	Sunk by Austrian sm., St. of Otranto	26?-6-16
161	Intrepido	d.	680	Sunk by mine, Adriatic	17-12-15
165	Impetuoso	d.	650	Sunk, Austrian sm., Otranto Straits	10- 7-16
	5-PN	t. b.	118	Torpedoed by Austrian sm. off Venice	26- 6-15
	17-OS	t. b.	118	Sunk by own mine while mine-laying off Salvore	- 7-15
158	Medusa	sm.	241-295	Torpedoed and sunk, Austrian sm.	17- 6-15
	Nereide	sm.	221-315	Sunk by Austrian sm., Adriatic	5- 8-15
165	Giacinto Pullino	sm.	400	Captured by Austria	- 8-16
165	——	sm.	——	Reported missing	- 8-16
161	Re Umberto	tr.	——	Sunk by mine, Adriatic	17-12-15

LOSSES OF GERMANY AND HER ALLIES

GERMAN WARSHIP LOSSES

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
164	Pommern	b.	13,040	Sunk by gunfire, battle of Jutland	31- 5-16
164	Lutzow	b. c.	28,000	Sunk by gunfire, battle of Jutland	1- 6-16
155	Yorck	a. c.	9,350	Sunk by German mine near Wilhelmshaven	3-11-14
155, 156, 158	Scharnhorst	a. c.	11,420	Sunk by English forces off Falklands	8-12-14
155, 156, 158	Gneisenau	a. c.	11,420	Sunk by English forces off Falklands	8-12-14
155	Friederich Karl	a. c.	8,858	No official report. Press reports that she was lost in the Baltic	12-14
156, 163	Bluecher	a. c.	15,550	Sunk by British forces off Doggerbank	24- 1-15
160	Prinz Adalbert	a. c.	8,858	Sunk by British sm. in Baltic	23-10-15
153, 154	Mainz	p. c.	4,280	Sunk by British forces, North Sea	28- 8-14
153, 154	Koeln	p. c.	4,280	Sunk by British forces, North Sea	28- 8-14
153, 154	Ariadne	p. c.	2,618	Sunk by British forces, North Sea	28- 8-14
154, 155	Hela	p. c.	2,003	Sunk by British sm. E-9, North Sea	13- 9-14
153	Augsburg	p. c.	4,280	By gunfire	7- 8-14
154, 155, 156, 163, 164	Emden	p. c.	3,592	Sunk by Australian c. Sydney, Indian Ocean	9-11-14
154, 155, 156, 160	Leipzig	p. c.	3,200	Sunk by English forces off Falklands	8-12-14
155, 156, 158	Nurnberg	p. c.	3,396	Sunk by English forces off Falklands	8-12-14
158	Dresden	p. c.	3,592	Sunk by British cruisers in Pacific	14- 3-15
153, 156, 158, 162	Koenigsberg	p. c.	3,340	Sunk by English forces in Rufiji River	11- 7-15
160, 161	Undine	p. c.	2,672	Sunk by British sm. in the Baltic	7-11-15
161	Bremen	p. c.	3,300	Sunk by sm. in the Baltic	17-12-15
	Friedrich	c. c.	8,865	Interned, Norfolk	7- 4-15
157	Kronprinz Wilhelm	c. c.	14,705	Interned, Norfolk	29- 4-15
155	Berlin	c. c.	17,324	Interned, Norway	16-11-14
	Patagonia	c. c.	——	Seized by Argentina, violation of neutrality	
	Eber	c. c.	1,000	Interned, Bahia	9-14
161	Kormoran II	c. c.	3,508	Interned, Guam	15-12-14
159	—— (two)	l. c.	——	Gulf of Riga	17- 8-15
153	Magdeburg	l. c.	4,478	Ran ashore in fog in Baltic; blown up by own crew after engagement with Russians	27- 8-14
155	Geier	l. c.	1,630	Interned in Honolulu	8-11-14
162	Karlsruhe	l. c.	4,822	Press reports state she was blown up by internal explosion while cruising in the Atlantic	4-11-14
164	Elbing	l. c.	5,000?	Sunk by gunfire, battle of Jutland	1- 6-16
164	Weisbaden	l. c.	5,000?	Sunk by gunfire, battle of Jutland	1- 6-16
164	Rostock	l. c.	4,820	Sunk by gunfire, battle of Jutland	1- 6-16
164	Frauenlob	l. c.	2,650	Sunk by gunfire, battle of Jutland	1- 6-16
	Moewe	g. b.	640	Sunk by her own crew at Dar-es-Salam when English vessels appeared	14- 8-14
	Wissman	g. b.	about 300	Captured by English on Lake Nyasa	20- 8-14
	Planet	g. b.	640	Sunk by her own crew at Yap Island on approach of Japanese fleet	7-10-14
155, 162	Cormoran	g. b.	1,604	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155, 162	Iltis	g. b.	886	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155, 162	Tiger	g. b.	886	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155, 162	Luchs	g. b.	886	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155, 162	Jaguar	g. b.	886	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
	Tsing-tau	g. b.	168	Interned, China	17- 8-14
	Vaterland	g. b.	168	Interned, China	17- 8-14
154	V-187	d.	689	Sunk by British forces, North Sea	28- 8-14
154	S-115	d.	413	Sunk by English destroyers, North Sea.	17-10-14
154	S-117	d.	413	Sunk by English destroyers, North Sea.	17-10-14
154	S-118	d.	413	Sunk by English destroyers, North Sea.	17-10-14
154	S-119	d.	413	Sunk by English destroyers, North Sea.	17-10-14
154, 162	S-90	d.	396	Driven ashore and wrecked by own crew off Tsing-Tao after having torpedoed the Japanese ship Takachiho	20-10-14
155	Taku	d.	276	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	7-11-15
155	S-124	d.	463	Accidentally rammed and sunk by a merchant vessel in Baltic	22-11-14
	V-186	d.	750	By gunfire	
	S-106	d.	675	By gunfire	

GERMAN WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
154	S-126	d.	487	By sm.	6-10-14
159	G-196	d.	689	Sunk by British sm., North Sea	26- 7-15
159	——	d.	——	Announced by France as sunk by two French torpedo-boats off Belgian coast.	22- 8-15
	——	d.	——	Reported sunk by Russians in Baltic	19- 8-15
	——	d.	——	Reported sunk by British sm. E-19 between Denmark and Sweden. Not confirmed	14-10-15
	——	d.	——		
	S-116	t. b.	477	Sunk by English sm. E-9, North Sea	6-10-14
164	—— (five)	d.	——	Sunk by gunfire, battle of Jutland	1- 6-16
	A-2	t. b.	about 150	Sunk by British destroyers, North Sea	1-15-15
	A-6	t. b.	about 150	Sunk by British destroyers, North Sea	1-15-15
	——	t. b.	——	Officially announced by Russia, blown up by mine	30- 6-15
	——	t. b.	——	Announced by German Admiralty, sunk by mines, Baltic	19- 8-15
	——	t. b.	——	Announced by German Admiralty, sunk by mines, Baltic	19- 8-15
	——	t. b.	——	Sunk by sm., Baltic	17-12-15
159	—— (eight)	t. b.	——	Gulf of Riga	17- 8-15
	——	t. b.	——	Collision, Baltic	15-10-15
153	U-15	sm.	about 450	Sunk by British c. Birmingham	10-10-14
155	U-18	sm.	——	Destroyed by English d. Garry off Scotch coast	23-11-14
160, 161	U-8	sm.	246-295	Sunk by British destroyers	4- 3-15
	U-51	sm.	——	Sunk, Black Sea	17- 7-15
	U-12	sm.	246-295	Rammed and sunk by British d. Ariel	10- 3-15
157	U-29	sm.	——	Announced sunk by British. Loss admitted by German Admiralty	26- 3-15
	U-14	sm.	about 300	Sunk by British forces	8- 6-15
	U-	sm.	——	Officially announced by French sunk in English Channel by French squadron.	4- 7-15
159	U-27	sm.	840-890	Announced by German Admiralty as missing	10- 8-15
	——	sm.	——	Announced by English Admiralty as sunk by British aeroplane off Belgian coast. Denied by Germany	20- 8-15
163	U-35	sm.	——		
	——	sm.	——	Reported run ashore near Riga in Baltic and probably lost. Not confirmed by Germany	19- 8-15
	U-	sm.	——	Interned in Holland. Reported as being the U-8, but this vessel had been officially reported as having been sunk by the British	
	U-	sm.	——	Reported by British Admiralty as sunk by British seaplane off Belgian coast.	27-11-15
156	U-3	sm.	——	Rammed	9- 8-14
166	U-41	sm.	——	Sunk by gunfire	24- 9-15
166	U-20	sm.	——	Accidentally grounded and destroyed by crew	4-11-16
	Prince Adalbert	ax. c.	6,030	Captured by British c.	- 8-14
	Sudmark	ax. c.	5,113	Captured by British c.	15- 8-14
153	Hedwick von Kaiser Wilhelm der Grosse	ax. c.	13,952	Sunk by British c. Highflyer	27- 8-14
	Bethania	ax. c.	7,548	Captured by British c.	7- 9-14
	Spreewald	ax. c.	3,899	Captured by British c.	12- 9-14
153	Cap Trafalgar	ax. c.	18,710	Sunk by British ax. c. Carmania	14- 9-14
	Max Brock	ax. c.	4,579	Captured by British c.	- 9-14
159	Itolo	ax. c.	299	Sunk by French g. b. at Cameroon	24- 9-14
	Rhios	ax. c.	150	Sunk by French g. b. at Cameroon	24- 9-14
	Soden	ax. c.	150	Captured by English c. off Cameroon River	1-10-14
	Gneisenau	ax. c.	8,185	Sunk by Belgians prior to evacuation of Antwerp	8-10-14
	Graecia	ax. c.	2,753	Captured by English c.	10-10-14
	Markomannia	ax. c.	4,505	Sunk by British c. in Indian Ocean	16-10-14
	Navarra	ax. c.	5,794	Sunk by English ax. c. in Atlantic	11-11-14
	Greif	ax. c.	——		
	Eleonore Woermann	ax. c.	4,624	Sunk by Australian c. Australia	6- 1-15
158	Macedonia	ax. c.	4,347	Captured	30- 4-15
	——	ax. c.	——	Reported as sunk in the Baltic	- 8-15
162	Greif	ax. c.	1,165	Sunk in battle, North Sea	29- 2-16
154	Comet	ax. c.	977	Captured by Australian forces	18-10-14

GERMAN WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
	Karnac	ax. tr.	4,437	Interned, Chile	-11-14
164	Hermann	ax. c.	3,000	Sunk by Russian destroyers	13- 6-16
153	Königin Luise	m. l.	2,163	Sunk by English d., North Sea	5- 8-14
	Rufin	m. l.	——	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies	7-11-15
	——	m. l.	——	Reported by the French captured outside of Havre disguised as French collier	
158, 159	Albatross	m. l.	2,165	Sunk by Russians in Baltic. Reported raised and interned in Sweden	2- 7-15
159	Meteor	m. l.	3,613	Sunk by own crew after attempting to escape British forces, North Sea	8- 8-15
	Bunz	p. b.	——	Lost in Baltic	17-12-15
157	Prinz Eitel				
	Kingani	a. m. v.	——	Captured by the British on Lake Tanganyka	
	Locksun	n. t.	1,020	Interned, Honolulu	8-11-14
158	Ophelia	——	1,153	Captured by English c., North Sea. English claim vessel an ax. c., while Germany claims her a hospital ship	17-10-15
	Several armed trawlers			Sunk by Russian destroyers	13- 6-16

In addition to the above, there seems to be no doubt that a great number of German submarines have been destroyed around the British Isles and possibly also in the Mediterranean and near the Dardanelles.

AUSTRIAN WARSHIP LOSSES

153	Zenta	c.	2,264	Sunk by French fleet off Antivari	16- 8-14
155, 162	Kaiserin Elizabeth	c.	3,937	Sunk by her own crew at Tsing-Tao	7-11-14
161	—— (Novara type)	c.	3,384	Torpedoed	13- 1-16
	——	g. b.	——	Sunk, Adriatic	24- 5-15
	Temes	r. m.	433	Struck a mine and sank off Shabatz	23-10-14
161	Triglav	d.	787	Sunk by gunfire in Adriatic	29-12-15
161	Lika	d.	787	Sunk by mine in Adriatic	29-12-15
153	No. 19	t. b.	78	Struck by a mine and sank at entrance to Pola	18- 8-14
	——	t. b.	——	Sunk by mine in Adriatic	
	——	t. b.	——	Sunk by mine in Adriatic	
	——	sm.	——	Sunk by an Italian d.	17- 5-15
	U-18	sm.	685-860	Reported by France sunk by a French aeroplane, Adriatic	1- 7-15
159	U-12	sm.	——	Torpedoed and sunk by an Italian sm., upper Adriatic	12- 8-15
159	U-3	sm.	233-295	Sunk by French d. Bisson	13- 8-15
	——	sm.	——	Gunfire, French fleet	
	U-11	sm.	860	Sunk by aeroplane	1- 7-15
	——	tr.	5,000	Sunk by Italian warships, Dmazzo roads; loaded with munitions	
	——	tr.	3,000	Sunk by Italian warships, Dmazzo roads, loaded with munitions	
162	Elektra	h. s.	——	Torpedoed, Adriatic	18- 3-16
	Beethoven	tr. s.	——	Struck a mine and foundered	17-12-14

TURKISH WARSHIP LOSSES

155	Messudyeh	b.	10,000	Sunk by British sm. B-11, Dardanelles	14-12-14
	Kheyr-Ed-Din	b.	9,900	Torpedoed by British, Sea of Marmora	9- 8-15
158	Mejidieh	c.	3,330	Sunk by Russian mine, Gulf of Odessa	3- 4-14
161	Burak Reis	g. b.	502	Scuttled to avoid capture	31-10-14
158	Pelenk-I-Derih	g. b.	886	Sunk in Sea of Marmora, British sm.	24- 5-15
	Marmaris	g. b.	492	Sunk by British in Tigris River	1- 6-15
158, 159	Berk-i-Satvet (type)	g. b.	725	By mine near Dardanelles	29- 4-15
161	Issa Reis (type)	g. b.	500	Scuttled	1-11-14
	Doruk Reis	g. b.	502	Officially reported by Petrograd as sunk in Black Sea	10-12-15
	Malatia	g. b.	210	Officially reported by Petrograd as sunk in Black Sea	10-12-15
	Yadikar Nilet	d.	610	Sunk by British sm.	- 5-15
159	Barbarossa				
159, 161	Yar Hissar	d.	284	Sunk by British sm., Sea of Marmora	3-12-15
	Demir Hissar	t. b.	97	Stranded and interned at Chios	17- 4-15
157	Dhair Hissar	t. b.	97	Driven ashore, Greece	17- 4-15
	Nagara	tr.	——	Sunk by British sm., Sea of Marmora	- 5-15
158	—— (three)	tr.	——	Sunk by Russian warships; contained troops	

TURKISH WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
160	Carmen	tr.	4,424	Sm., Marmora	24-10-15
161	Rechid Pasha	tr.	8,000	Sm., Marmora	-12-15
	Bezemialen	tr.	——	Sunk, Black Sea	14-11-14
	Bachriachmar	tr.	——	Sunk, Black Sea	14-11-14
	Midiat Pasha	tr.	——	Sunk by sm.	6- 9-15
166	Rodosto	tr.	6,000	Captured by Russian sm	-10-16

In addition to the above, other Turkish men-of-war may have been destroyed around the Dardanelles and in the Black Sea. Reports from England, Russia and Turkey in regard to these operations are so conflicting that it is impossible to accurately state what Turkish vessels have been destroyed, especially transports and supply ships.

INDEX OF WAR VESSEL LOSSES MENTIONED IN THIS NUMBER

BRITISH VESSELS

Flirt 2062
Nubian 2062
Franconia 2064

RUSSIAN VESSELS

Imperatrista Maria 2065

FRENCH VESSELS

Faucault 2064
Gallia 2064

TURKISH VESSELS

Rodosto 2064

GERMAN VESSELS

U-41 2079
U-20 2063

DIPLOMATIC NOTES

Prepared by A. F. WESTCOTT, PH. D., Instructor, U. S. Naval Academy

MAILS CONTROVERSY

In a memorandum dated **October 12,** the British and French governments replied to the second American note of **May 12, 1916,** protesting against delays and seizure of neutral mails. The reply, while it called attention to measures taken to lessen the annoyance of detention and censorship, was in general a defence of the legality of the practices adopted.

SUMMARY

The memorandum, 4000 words long, contains the following points:

1. Agreement as to general principles involved, *i. e.,* post parcels recognized as being under the common rule of merchandise subject to the exercise of belligerent rights; private mails subject to inspection for contraband. Disagreement only as to methods.

2. Inspection of mails, involving opening of covers, cannot be made on ship-board without confusion, delay, and losses; hence the practice of conveying mails to shore stations.

3. Mails examined on shore are accorded the same treatment as if examined at sea. Visits made to a vessel taken to port for examination of mails are in this respect on the same footing as visits on the high seas. But when vessels call "voluntarily" at allied ports, they place themselves under port laws, and it is legitimate for the authorities to make sure that such vessels carry nothing inimical to the national defence before granting clearance.

4. The enemy practice of enclosing hostile correspondence in apparently neutral mails, makes it necessary to examine mails to or from countries neighboring Germany as if mailed from or to Germany itself.

5. Convention XI of the Hague does not apply since it was not ratified by six of the belligerents. As for the previous practice of nations, "no general rule can easily be seen therein prohibiting belligerents from exercising surveillance, visitation, and, the case arising, seizure and confiscation, of mails."

6. The practice of Germany has been, not to examine mails, but to destroy them, together with ship and cargo. The practice of other nations in previous wars is cited in support of the Allies' position.

7. Shares, bonds, money orders, and other negotiable papers are admittedly merchandise and subject to the exercise of belligerent rights. But lists of money orders, also, mailed from the United States to Germany, are taken in Germany as the equivalent of the orders themselves, and hence must be so regarded by the Allies.

POINTS AT ISSUE

The most that can be said for the progress thus far made in the correspondence is that it has narrowed the subjects of dispute down to a pretty definite area—the question of what treatment shall be accorded to first-class mail carried on neutral ships and marked for a neutral destination, and the question of the contraband or non-contraband character of postal money-order lists—these latter being declared in the Anglo-French note to be virtual transmittals of money, while our own government asserts that they are merely ordinary letters.—*N. Y. Nation,* 19/10.

BLACKLIST NOTE

In a note dated **October 10, 1916,** Great Britain replied to the United States "black list" protest of **July 28.** The reply denied that the British Government was seeking to impose disabilities or penalties on neutrals, and defended the right of Great Britain to forbid its subjects to deal with any firms that trade with its enemies.

SUMMARY OF THE NOTE

1. The "black list is issued in accordance with the 'Trading with the Enemy (extension of powers) Act' of 1915. This is a piece of purely municipal legislation and provides that His Majesty may by proclamation prohibit persons in the United Kingdom from trading with any persons in foreign countries who might be specified in such proclamations or in subsequent orders. . . . . His Majesty's Government neither purport nor claim to impose any disabilities or penalties upon neutral individuals or neutral commerce."

2. The legislation does not interfere with the rights or property of blacklisted firms. "The only disability they suffer is that British subjects are prohibited from giving them the support and assistance of British credit and British property."

3. The list includes, not only United States firms, but firms in other neutral countries and in Allied countries. Hence it is evident that it is not directed against neutral trade but is a part of general belligerent operations designed to weaken the enemy's resources.

4. Since the advantage of foreign trade is mutual, self-interest alone will prevent the British Government from extending the list further than necessary.

5. Circumstances justify the resort to this novel expedient, in that (a) German houses abroad have done all in their power to help the cause of Germany, and have in a large number of cases been used as part of an organization for the furtherance of German political and military ambitions; (b) German business houses abroad have been used for dissemination of political and social influence, for espionage, as bases of supply for German cruisers, and as organizers of attacks on munitions factories.

6 "Even though the military situation of the Allies has greatly improved, there is still a long and bitter struggle in front of them" which justifies every measure that can legitimately be used against the enemy. Inconvenience to neutrals is not to be compared to the suffering to mankind by prolongation of the war.

7. The refusal to supply coal to ships carrying the goods of blacklisted firms is justifiable as a purely national measure.

AMERICAN COMMENT

It is conceded here that the legal defence made by Viscount Grey is unassailable, but there are intimations that in the American response it will be urged on grounds of international comity that the operation of the British blacklist should not be enforced so as to prevent firms in the United States, covered by the blacklist, from dealing with other neutral firms.

The note of Viscount Grey opens the door for further discussion in several respects and is interpreted in some quarters as embracing an invitation for this government to discuss the question of alleged flaws in the enforcement of American neutrality.

It is possible that this government may ask the British Government to particularize in its allegation that the United States Government has failed to prevent certain alleged violations of neutrality.—*N. Y. Times,* 16/11.

SCANDINAVIA AND THE BLOCKADE

LONDON, September 15.

Lord Robert Cecil, Minister of War Trade, to-day explained the recent orders of the British Government, refusing to allow Holland to accept further consignments of American goods and refusing letters of assurance that American shipments would reach Scandinavia. He said the orders applied only to certain prohibited articles and not to trade in general.

Great Britain has forbidden the export of various articles to European neutrals on the ground that they have already received in the first seven months of this year more than an ordinary year's supply. Lord Robert said it was not logical to forbid such exports from Great Britain and to permit them from America and other neutral sources.

Lord Robert explained that one neutral nation, taking normally 18,000 tons of coffee, in seven months of this year, already had imported 50,000 tons, so all further imports of coffee to that country would be regarded as likely to reach an enemy destination. The list of prohibited articles, he said, varied with different countries, according to what they already had imported, all allowances being made for imports formerly made to German ports.—*N. Y. Times*, 16/9.

IMPORTS TO SWEDEN

In a statement issued October 6, Sir Robert Cecil declared the willingness of his government to facilitate the import into neutral countries, including Sweden, of all goods needed for home requirements, allowing for the normal development of industries; provided that satisfactory guarantees are obtained either from the importers or a government body that no goods in any form will be re-exported to the enemy. It follows that the unrestricted import of goods which would release home products of similar nature for exportation cannot be agreed to by us. That for all practical purposes will be the same thing as importing goods through Sweden into Germany.

Lord Robert said the best plan for arranging imports was undoubtedly through agreements such as exist with Holland, Norway and Denmark, where all goods are controlled by a Central Association or by associations of traders interested in the various industries.—*N. Y. Times*, 6/10.

SWEDISH EXPORTS STOPPED

COPENHAGEN, October 7.

According to official telegrams received from Gothenburg this afternoon, the export of Swedish goods to England has been stopped since 2 o'clock Friday. The regulations adopted by the British Government provided that after October 1 all goods shipped from Sweden to England must be accompanied by certificates of their Swedish origin.

Swedish exporters, having asked their government how they should conduct themselves in view of the conflict between the British and Swedish regulations, received an official reply forbidding them to fill out the new bills of lading, and thereupon shipments immediately stopped.

According to a telegram from Stockholm, the prohibition for the present affects only raw materials, but it is expected soon to cover provisions.—*N. Y. Times*, 8/10.

SUBMARINES IN NEUTRAL WATERS

In a memorandum dated **August 31** and made public October 10, Secretary Lansing denied the request of the Entente that both war and merchant submarines be excluded from neutral waters. The

reply declared that belligerents must take the responsibility of distinguishing between neutral and enemy submarines.

TEXT OF ENTENTE MEMORANDUM

In view of the development of submarine navigation and by reason of acts which in the present circumstances may be unfortunately expected from enemy submarines, the allied governments consider it necessary, in order not only to safeguard their belligerent rights and liberty of commercial navigation, but to avoid risks of dispute, to urge neutral governments to take effective measures, if they have not already done so, with a view to preventing belligerent submarine vessels, whatever the purpose to which they are put, from making use of neutral waters, roadsteads, and ports.

In the case of submarine vessels, the application of the principles of the law of nations is affected by special and novel conditions; first, by the fact that these vessels can navigate and remain at sea submerged, and can thus escape all control and observation; second, by the fact that it is impossible to identify them and establish their national character, whether neutral or belligerent, combatant or noncombatant, and to remove the capacity for harm inherent in the nature of such vessels.

It may further be said that any place which provides a submarine warship far from its base with an opportunity for rest and replenishment of its supplies thereby furnishes such addition to its powers that the place becomes in fact, through the advantages which it gives, a base of naval operations.

In view of the state of affairs thus existing, the allied governments are of the opinion that submarine vessels should be excluded from the benefit of the rules hitherto recognized by the law of nations regarding the admission of vessels of war or merchant vessels into neutral waters, roadsteads, or ports, and their sojourn in them. Any belligerent submarine entering a neutral port should be detained there.

The allied governments take this opportunity to point out to the neutral powers the grave danger incurred by neutral submarines in the navigation of regions frequented by belligerent submarines.

LANSING'S REPLY

WASHINGTON, August 31, 1916.

The government of the United States has received the identic memoranda of the governments of France, Great Britain, Russia, and Japan in which neutral governments are exhorted "to take efficacious measures tending to prevent belligerent submarines, regardless of their use, to avail themselves of neutral waters, roadsteads, and harbors." These governments point out the facility possessed by such craft to avoid supervision or surveillance or determination of their national character and their power "to do injury that is inherent in their very nature," as well as the "additional facilities" afforded by having at their disposal places where they can rest and replenish their supplies. Apparently on these grounds, the allied governments hold that "submarine vessels must be excluded from the benefit of the rules heretofore accepted under international law regarding the admission and sojourn of war and merchant vessels in neutral waters, roadsteads, or harbors; any submarine of a belligerent that once enters a neutral harbor must be held there," and therefore the allied governments "warn neutral powers of the great danger to neutral submarines attending the navigation of waters visited by the submarines of belligerents."

In reply the government of the United States must express its surprise that there appears to be an endeavor of the allied powers to determine he rule of action governing what they regard as a "novel situation" in respect to the use of submarines in time of war, and to enforce a compliance of

that rule, at least in part, by warning neutral powers of the great danger to their submarines in waters that may be visited by belligerent submarines. In the opinion of the government of the United States, the allied powers have not set forth any circumstance, nor is the government of the United States at present aware of any circumstances concerning the use of war or merchant submarines which would render the existing rules of international law inapplicable to them. In view of this fact, and of the notice and warning of the allied powers announced in their memoranda under acknowledgment, it is incumbent upon the government of the United States to notify the governments of France, Great Britian, Russia, and Japan that, so far as the treatment of either war or merchant submarines in American waters is concerned, the government of the United States reserves its liberty of action in all respects, and will treat such vessels as, in its opinion, becomes the action of a power which may be said to have taken the first steps toward establishing the principles of neutrality, and which for over a century has maintained those principles in the traditional spirit and with the high sense in which they were conceived.

In order, however, that there should be no misunderstanding as to the attitude of the United States, the government of the United States announces to the allied powers that it holds it to be the duty of belligerent powers to distinguish between submarines of neutral and belligerent nationality, and that responsibility for any conflict that may arise between belligerent warships and neutral submarines on account of the neglect of a belligerent to so distinguish between these classes of submarines must rest entirely upon the negligent power. LANSING.

DUTCH REPLY

LONDON, October 22.

Replying to the Entente Allies' submarine note, the Dutch Government intimates that in consequence of the uncertainty of the status of submarines they will be treated as warships, and, in accordance with the Dutch neutrality proclamation, will not be allowed to enter or remain in Dutch waters except on well-defined conditions.

The government, however, will not intern merchant submarines, because there is no principle of international law which would justify such a course. —*N. Y. Times*, 22/10.

NORWAY RESTRICTS SUBMARINES

The Norwegian ordinance of October 13 with respect to submarines of belligerent powers forbids such vessels traversing Norwegian waters, except in cases of emergency, when they must remain upon the surface and fly the national flag. Mercantile submarines are to be allowed in Norwegian waters only in a surface position in full daylight and flying the national colors. Any submarine violating the ordinance will, according to its provisions be attacked by armed forces.—*N. Y. Times*, 22/10.

GERMAN PROTEST

According to Christiania despatches dated October 22, Germany protested against Norway's submarine ordinance, declaring it in conflict with Paragraph 13 of the Hague Convention and incompatible with strict neutrality.

NORWAY'S REPLY

BERLIN, November 13 (via London).

Although the Norwegian answer to the German note with respect to the submarine question has not yet been made public, the *Lokalanzeiger* learns that it is couched in a conciliatory, spirit even though it does not concretely offer enough to warrant its being called satisfactory. Verbal explanations, which accompanied the note, says the *Lokalanzeiger*, were such that it is not impossible that an understanding will be reached.

The paper points out anew, however, that the solution of the difficulty and the future relations between the two countries depend wholly on Norway and the further explanations it may choose to make, and not upon Germany, which "is watching developments with calmness."—*N. Y. Times*, 14/11.

"CEBU" CASE

On September 11 the Philippine steamer *Cebu* was held up by a British destroyer within one and a half miles of Carabao Island, within Philippine territorial waters. The object of the destroyer was to capture a German reservist who with other Germans had been using Manila as a headquarters for activities against British government in India. The German was not found on board.

On September 20 the British Government expressed regret for the incident, explaining that when the *Cebu* was boarded the land was hidden by fog.

GERMANY

German Submarine Policy

BERLIN, November 15 (via Sayville.)

To-day Under Secretary of State Zimmermann not only confirmed the previous statement that the submarine *status quo* still exists unmodified, but issued the following important statement more clearly defining the German position:

"The German naval forces are not sinking neutral merchant ships *per se*. They are sinking as a defensive measure ammunition transports and other contraband shipments to our enemies that are calculated to lengthen the war. It is not strictly correct, therefore, to speak of 'submarine warfare' in this connection. We are conducting cruiser warfare, waged by means of submarines, acting in punctilious compliance with the rules of international law applying to cruiser warfare. Our position, therefore, both militarily and from the viewpoint of international law is irreproachable, and the propagandistic accusation and charge in connection with ships sunk, as agitated by the English press, are interesting and important only as indicating how hard England is being hit by our defensive submarine measures against England's hunger war and England's economic strangle hold on the neutral nations in question."—*N. Y. Times*, 16/11.

ACTIVITIES OF *U-53*

Explanation Requested

As a result of the sinking, on October 8, of three British and two neutral merchant vessels by the German submarine *U-53*, off Nantucket Lightship (see War Notes), Secretary Lansing directed an inquiry to the German Government.

"Stephano" Stopped by Solid Shot

The first warning received by the Red Cross Line steamship *Stephano* on Oct. 8 from *U-53* was a solid shot which struck her on the port bow.

This was the gist of an affidavit made yesterday by Capt. Clifton Smith at the British Consulate. He said the German submarine was sighted at 6 p. m., and at 6.05 a shot was fired by her which struck the *Stephano* under the forefoot on the port side, twisting the stem of the ship. At that time not a passenger had been removed from the steamship, and the captain was not aware that he was in the hands of an enemy craft until the shell struck his ship.

His statement was corroborated by Hugh F. Graham, manager of *The Register*, published at Dobbs Ferry, N. Y., in a letter sent to the Red Cross Line office yesterday.—*N. Y. Times*, 12/10.

SUBMARINES VS. MERCHANT VESSELS

An article by E. W. Crecraft, *N. Y. Times*, October 15, contends that the defensive weakness of submarines should not deprive merchantmen of the right to arm for defence nor should it lead to modification of the rules of visit and search. The article is in part as follows:

"Why should the new international law compel a large ocean liner or even a freighter to stand idly by and be sent to the bottom of the sea by a small war craft which could easily be kept off by a small armament on board, when present international law gives merchant vessels the right to carry arms to resist illegal attack? We may ask, is it armament alone that renders the merchantman superior to the submarine? And are we to accept the full German contention that the mere presence of arms on the merchantman is, in view of the weakness of the submarine, an offensive armament? To these it must be replied that other things besides a small caliber gun combine to make merchantmen generally superior to submarines. The merchantman has an inherent superior strength in being able to ram the small craft. Why not say, therefore, that so long as merchantmen have prows that can ram they are superior to the submarine, that they are a menace to the exercise of the alleged right of the submarine to capture enemy merchantmen at sea, and that they are aggressively armed by their very structure? Certainly no such absurd conclusion can occupy the mind of the most ardent enthusiast over the submarine.

"In accordance with the general principle of visit and search and the destruction of prizes, submarine activities such as were witnessed off Nantucket cannot be described as legal. The regular procedure in exercising the right of visit and search is to take the vessel into port. If we are to hold at this time that the *U-53* obeyed the law of nations we must be prepared to hold also that Sunday's procedure will in the future be the regular practice of warships in dealing with passenger and freight vessels. It will be an exceptional occasion in future wars when a prize will be taken into port; it is likely also to be an exceptional case when passengers and non-combatant crews are saved."

"U-41" EPISODE

A new Baralong case was submitted by the German Admiralty in its account (Nov. 4, 1916) of the loss a year preceding (Sept. 24, 1915) of the German *U-41*. According to the German statement, a British patrol, disguised as a merchantman and flying the United States flag, sank the submarine, which had hailed and approached her, and after ran down a boat containing a German lieutenant and a petty officer. The two survivors were later picked up, but, though wounded, they were left without medical attention till the following day. After considerable delay, due it is stated to fear lest news of the attack should be published, the German officer was transferred to Switzerland and submitted his report. The account is taken by German authorities to prove that the British have ordered that no submarine prisoners be taken.

LONDON, November 14.

The Admiralty has issued a further reply to the German charge regarding the treatment of survivors of the German submarine *U-41*, including the report of the commander of the British ship which sank the submarine, and affirms:

"It is directly, explicity, and completely untrue to allege that there exists, or even has existed, an Admiralty order that it is not necessary to rescue the survivors of the crews of German submarines."

According to the British Admiralty a British auxiliary flying a neutral flag approached a German submarine on September 24, engaged in sinking a British merchantman. When within range the auxiliary hoisted a white naval ensign and fired on and sank the submarine and then rescued

the crew of the merchantman from their boats. When this was done, the auxiliary also rescued two of the submarine's crew, who had climbed into a drifting boat.—*N. Y. Times,* 13/11.

On **October 28** the British freighter *Marina,* 5204 tons, Glasgow to Baltimore, was sunk by a German submarine 100 miles west of Cape Clear, Ireland. Heavy weather prevailed at the time of and after the sinking. Of 58 Americans on board, six were lost.

"MARINA" NOT WARNED

Consul Frost at Queenstown has obtained a joint affidavit from the Americans who reached Crookhaven and a similar document from American survivors at Bearhaven. The affidavits agree that the *Marina* was torpedoed without warning, that the first torpedo struck on the starboard side and the second hit the vessel 12 minutes later and was followed by a boiler explosion, the steamer sinking six minutes afterward. No Americans were killed by the boiler explosion. Those who lost their lives were drowned as the lifeboats were launched.

According to this information, a submarine which emerged after the second torpedo was fired was seen plainly by Americans on the *Marina,* but did not communicate with the steamship or offer assistance to the small boats, which were in deadly peril from the rough sea.

The affidavits of the Americans say that the *Marina* had a 4.7-inch gun mounted astern, but that it was not used, as the ship had no warning of the submarine attack and it was too late after the torpedo hit the vessel. The submarine did not shell the *Marina.*

It is regarded here as probable that the American State Department will make still further inquiries with the object of definitely determining the status of the *Marina.* While it is said that she was under private charter when she was torpedoed, it appears that the vessel may have been engaged in Admiralty work not long before.—*N. Y. Times,* 2/11.

UNITED STATES TAKES ACTION

WASHINGTON, October, 31.

Under instructions from President Wilson, the State Department has cabled to the American Embassy in Berlin to make informal inquiries of the German Government concerning the sinking of the British freight steamer *Marina,* with a view to ascertaining what information Germany has on the subject.

Walter H. Page, the American Ambassador at London, has been instructed to obtain all the facts available with particular reference to the loss of American lives and whether the *Marina* was sunk without warning. —*N. Y. Times,* 1/11.

SINKING OF THE "ROWANMORE"

Mr. Frost, consul at Queenstown, Ireland, sent two cablegrams concerning the sinking of the *Rowanmore.* The first read:

Furness freighter *Rowanmore,* bound from Baltimore for Liverpool with a mixed cargo, was attacked by a German submarine at 8.45 a. m. October 26, 140 miles west-southwest of Cape Clear. After 50 minutes' attempt to escape, the *Rowanmore's* steering gear was shot away. Master stopped and signaled he was abandoning ship. The submarine continued shelling her and shelled boats after the latter were clear. No casualties.

The second cablegram was as follows:

Submarine shelled *Rowanmore* and at 11.30 torpedoed her. Vessel did not sink until 2.40. Crew landed at Bantry at 10 a. m. of the 27th. There

were seven Americans on board, of whom five are Filipinos. The other two, intelligent Americans, were George Murphy of 740 Jefferson Avenue, Brooklyn, and Albert Sessler of 42 Sharon Street, Boston.—*N. Y. Times*, 31/10.

"ARABIA" TORPEDOED

The British Admiralty report, November 6, on the sinking of the Oriental liner *Arabia* reads as follows:

The homeward-bound Peninsular and Oriental mail steamer *Arabia* was torpedoed without warning and sunk in the Mediterranean at about noon on November 6. The vessel had 437 passangers, including 169 women and children.

All the passengers were saved by various vessels which were diverted to the scene of the disaster. Two engineers are missing, and are believed to have been killed by the explosion. The remainder of the crew were saved.—*N. Y. Times*, 9/11.

"COLUMBIAN" HELD UP AND SUNK

PARIS, November, 12.

A wireless dispatch from Madrid says that it was a German submarine which sank the American steamship *Columbian*.

According to this information, the *Columbian* encountered the submarine on November 6 during a violent tempest. The submarine compelled the *Columbian* to stop and lie to under surveillance until Nov. 8. When the storm subsided, the dispatch says, the submarine ordered the crew to abandon the ship and then sank her. The crew it is reported, afterward landed at Corunna, on the northwest coast of Spain.

The *Columbian* was an 8000-ton American steamship which left New York October 18, arrived in St. Nazaire, France, November 2, and left there November 3, for Genoa with a cargo of steel.—*N. Y. Times*, 13/11.

"LANAO" CASE

A dispatch from the American consulate in London, Nov. 7, read as follows:

"The Philippine steamer *Lanao*, Manila, Saigon to Havre, carrying rice, was stopped 30 miles off Cape St. Vincent, Portugal, by a German submarine on October 28. The *Lanao* was destroyed by a bomb after the crew were removed to the submarine, the submarine commander stating that the cargo was contraband and he was compelled to sink the vessel. The crew was transferred half an hour later to the Norwegian steamer *Tromp* and landed at Cardiff. No injuries, no casualties. The *Lanao* was unarmed and flying the American flag."

LONDON, November 7.

Lorin A. Lathrop, American Consul at Cardiff, has telegraphed to the Consulate here that the *Lanao* when sunk was still under Philippine registry and flying the American flag. Her transfer to the Norwegian flag was to have been made on her arrival in England.

Captain Mainland has telegraphed from Cardiff the following signed statement:

"The *Lanao* sailed from Hongkong under the American flag, which flew day and night and was flying when sunk. I heard rumors of sale, but nothing certain. The submarine captain gave a receipt for the ship's papers as from an American ship. The legal status of the vessel was Philippine registry under American protection, which gave the right to fly the American flag."

KINGDOM OF POLAND PROCLAIMED

On November 5, Germany and Austria proclaimed the establishment of the Russian provinces of Poland as an independent kingdom, the actual setting up of the autonomous state to take place after the establishment of

peace. The Austrian province of Galicia and the German province of Posen, it is understood, are not to be included in the new state.

AUSTRIA

AUSTRIAN PREMIER ASSASSINATED

The Austrian Premier, Count Karl Stuergkh, was assassinated in a restaurant in Vienna by Dr. Friedrich Adler, a publisher, on October 21. According to the confession of Dr. Adler the motive of the crime was political, the refusal of the Premier to convene Parliament.

Stuergkh's successor, Dr. Ernst von Koerner, on Nov. 1 announced his cabinet, three of whom held office in the former ministry.—*N. Y. Nation*, 26/10.

GREECE

SHIFTING CABINETS

The Zaimis government in Greece resigned September 12. After some delay, M. Kalogeropoulos, a supporter of Venizelos, formed on September 16, a new cabinet, pledged to "the most benevolent possible neutrality towards the Entente," but divided on the policy of Greek participation in the war. Failing of recognition by the Entente, this ministry was in turn forced to resign (October 4), and the premiership turned over to Prof. Spyridon P. Lambros (October 9). On October 11 all save three of the vessels of the Greek fleet were taken over by French naval authorities, and the remaining three disarmed.

In the meantime the Provisional government, established by Venizelos in Crete and Mitelyene, was transferred to Saloniki, and on October 12 issued a call to arms for the defence of Greek territory and in support of the Entente. This government was on October 16 officially recognized by the Entente Powers.

The further demands made upon King Constantine's government by the Entente include: (1) transfer of Greek troops from Thessaly (in the rear of the allied forces) to the Morean Peninsula; (2) surrender of munitions of war; (3) consent to recruiting for the Venizelist movement; (4) control of Piræus fortifications and of the Piræus-Larissa Railroad.

GREEK TRANSPORT TORPEDOED

The Greek ship *Angelika*, bound from Piræus to Saloniki with 150 officers and men who were to join the Venizelist forces, was torpedoed by a German submarine on the evening of October 29. According to the captain's statement, no warning was given, and a Greek vessel approaching to rescue survivors was warned off. About 50 persons were killed by the explosion. The attack was justified by the German legation at Athens on the ground that the transport was engaged in carrying reenforcements to the Allies at Saloniki.

CHINA AND JAPAN

NEW JAPANESE CABINET

Dispatches from Tokio, of October 4, announced that the Emperor had requested Lieut. General Count Terauchi to form a cabinet in succession to that of Marquis Okuma. The Emperor's choice of the new Premier marks the victory, for the time being, at least, of the reactionary bureaucratic party in its struggle with the more liberal parties, consolidated by the efforts of Marquis Okuma and Baron Kato, which favor a representative government.—*N. Y. Nation*, 12/10.

CHANGES IN FOREIGN POLICY

Count Terauchi's appointment as Premier was regarded with uneasiness yesterday by some students of Japanese affairs in this city. He was spoken of as a "swashbuckler" and "expansionist" on one hand, and on the

other as a cautious man who was not likely to change Japan's foreign relations.

Baron Yoshiro Sakatani, delegate to the recent Economic Conference in Paris, who is at the Hotel Astor, would not be interviewed on the appointment yesterday. Baron Sakatani, in an interview in *The Times* last week, declared that the status of Japanese in the United States must be settled after the war, although he believed that there would be an amicable understanding between the two nations. Baron Sakatani's assertions, the change of ambassadors at Washington and Count Terauchi's succession to the Premiership, were regarded by some as steps toward a firmer policy of Japan toward the United States in regard to the "open door" in China as well as the treatment of the Japanese in California.

Dr. T. Iyenaga, Director of the East and West News Bureau, said that Japan's foreign policy had been so well settled by the late Emperor that the change in premiers would probably have little effect on it.—*N. Y. Times*, 4/10.

JAPAN GIVES UP SOUTH SEA ISLANDS

TOKIO, October 14.

The *Associated Press* learns that Japan has agreed not to make a part of her demands in the peace conference which will follow the war the right to hold permanently the South Sea Islands which were wrested from Germany at the outbreak of the war. Several of these islands, which belong to the Caroline and Marianne groups, lie not far from the American island of Guam, the American terminus of the Pacific cable. It is understood the United States has informally expressed a desire that these islands should not become the permanent property of the Japanese Empire.

Inasmuch as they were captured through the joint operations of the British and Japanese fleets, it is understood the United States first took up the question with Great Britain and that a joint suggestion was made by Great Britain and the United States that Japan should not insist upon the permanent maintenance of the islands.—*N. Y. Times*, 10/11.

JAPANESE PRESSURE ON CHINA

PEKING, October 11.

Japan's insistence upon an immediate settlement of the demands growing out of the Cheng-chiatun incident is creating great uneasiness among Chinese officials.

The *Associated Press* correspondent is now able to give a paraphrase of the four demands and the four suggestions made by Japan, which is practically the text of Baron Hayashi's representations to the Foreign Office. The demands are as follows:

(1) The commander of the 28th division of the Chinese Army in Manchuria is to be reprimanded.

(2) Officers responsible for the Cheng-chiatun incident are to be dismissed, and those in direct command are to be severely punished.

(3) Orders are to be issued to Chinese troops in Southern Manchuria and Eastern Inner Mongolia that hereafter Chinese soldiers and officers are not allowed to act in such a way as to irritate and provoke Japanese troops and Japanese residents. Copies of these orders are to be posted at important centers.

(4) (a) The Chinese Government is to permit the stationing of Japanese police in interior Southern Manchuria and Eastern Inner Mongolia at such places as the Japanese Government may consider it necessary to station police for the protection and control of Japanese residents. (b) In Southern Manchuria Japanese are to be employed as police advisers.

The four suggestions, which Baron Hayashi has told the Chinese Government are not absolute demands, are as follows:

(1) In the principal military divisions in Southern Manchuria and Eastern Inner Mongolia a certain number of Japanese officers are to be employed as military advisers.

(2) Japanese officers are to be employed as instructors in the Chinese military academy.

(3) The Military Governor at Mukden, Chang Tso-ling, shall apologize to the Japanese Governor General at Port Arthur and the Japanese Consul General at Mukden for the Cheng-chiatun incident.

(4) A suitable sum of money is to be given to the Japanese wounded and to the families of the Japanese who were killed.—Correspondence of *The Associated Press, N. Y. Times,* 15/11.

AMERICAN CONTRACTS IN CHINA

PEKING, October 14.

Japan and Russia entered protests to-day against concessions for railway and canal construction in China which have been granted to Americans.

Russia's protest was against the construction by Americans of a railroad from Feng-Cheng, Shansi Province, to Lanchoy-Fu, in Kamsu Province, it being alleged that the Chinese minister in Petrograd promised orally 18 years ago that Russia should have the privilege of building railways in the vicinity of Mongolia.

Japan protested against the Chinese Government's agreement with American contractors for the reconstruction of 200 miles of the Grand Canal in Shantung. The Japanese claim by reason of their conquest of Shantung all rights heretofore held by Germany in that province.

Negotiations for American railway construction in China were concluded a fortnight ago and called for a $60,000,000 loan by the American International Corporation and the construction as soon as possible of 1500 miles of railway through the richest section of China by the Siems-Carey Company of St. Paul. An optional contract for the construction of an additional 1500 miles of railway later was contained in the agreement.

The loan was to be secured by the property in the road itself and not by concessions or government guarantees. The Chinese Government agreed to the appointment of an American engineer, who later was to act as the chief engineer of the road. George A. Kyle, a Great Northern Railway engineer, was recently appointed to the post and confirmed by China. The appointment of Americans as auditor and traffic manager was also agreed upon.—*N. Y. Times,* 15/10.

UNITED STATES

"CONSTRUCTIVE" WAR IN MEXICO

The State Department, it was announced in dispatches from Washington of October 21, regards a "constructive" state of war as existing in Mexico, thus upholding the opinion of the Judge-Advocate-General of the army that soldiers in Mexico may only be tried by military courts.—*N. Y. Nation,* 26/10.

DANISH WEST INDIES

Both Houses of the Danish Parliament passed the bill for a plebiscite on the sale of the Danish West Indies to the United States on September 30. It is believed the matter will be settled definitely by the end of November. The plebiscite also will include the Faroe Islands, but not Iceland and Greenland. Premier Zahle urged immediate action on the bill, in view of the fact that the United States Senate already had approved the treaty. Admiral Peary protests against our renunciation of our possible rights in Greenland, the largest island in the world with extensive fisheries, abundance of coal and rushing torrents, having potential power sufficient if translated into electric energy to make Greenland "a power house for the United States." It might be made valuable, too, strategically as a naval base.—*Army and Navy Journal,* 6/10.

ADJUDICATION OF NICARAGUAN CASE

WASHINGTON, November 12.

A prepared statement issued to-night on behalf of the American Peace Society, asserts that it is the duty of the United States Government to enter into an agreement with one of the protesting Central American nations to put the Nicaraguan treaty controversy before the Central American Court of Justice at Cartago for consideration and adjustment.

The Nicaraguan Treaty controversy has grown out of the ratification this year of a new treaty between the United States and Nicaragua by which Nicaragua, in consideration of the payment of $3,000,000 by this country, has ceded to the United States the right to build an interoceanic canal across Nicaragua and also the right to establish a naval base on the Nicaraguan shores on the Gulf of Fonseca, on which several other Central American nations also border.

The governments of Salvador, Costa Rica, and Honduras have protested against the treaty. The Central American Court of Justice recently decided that Nicaragua acted illegally in selling canal rights to the United States without consulting Costa Rica and in threatening the neutrality of Honduras by permitting a United States naval base to be established on the Gulf of Fonseca. The government of Nicaragua has refused to be bound by this decision. The statement issued by the American Peace Society asserts that "disruption threatens the Central American Union through our assertion of our technical freedom from the impositions of this decree." —*N. Y. Times*, 13/11.

REVIEW OF BOOKS

ON

SUBJECTS OF PROFESSIONAL INTEREST

"The Navy as a Fighting Machine." By Rear Admiral B. A. Fiske, U. S. N., President Naval Institute. $2.00 net. (New York: Chas. Scribner Sons.)

As we look around us in this world we see on every side and in every form of life a constant struggle for existence. The weeds and the flowers are contending for their share of the light and the air and the moisture of the earth. That which gains the most grows strong and expands and crowds the other out. The trees of the forest strive for the greater height and the greater spread of limb, and in their growth they smother beneath them the weaker ones, when there is not enough nourishment for all. And so it is in every form of animal and insect life. It is this inherent struggle to grow strong and to expand that pervades all life.

It would seem as though when this world was created a law was given which decreed that life should be a battle and in order to grow strong and progress and to expand you must fight, and when you cease to fight you cease to progress and that is the beginning of the end.

Admiral Fiske in his latest book "The Navy as a Fighting Machine" clearly shows by numerous citations of history how this law applies to the life of nations. He traces their struggle to attain their desires, their tendency to cease struggling when their desires are satisfied and the inevitable decline and extinction which follows. The author points out that,

"Every great nation has started from a small beginning and risen sometimes gradually, sometimes rapidly to greatness, and then fallen sometimes gradually, sometimes rapidly to mediocrity, dependence, or extinction; that the instrument that has effected the rise has always been military power, usually exerted by armies on the land, sometimes by navies on the sea; and that the instrument which has effected the actual fall has always been the military power of an adversary."

He examines the facts of history as to the cause of the longevity of some nations and the short life of other nations and concludes that,

"Civilization and the peaceful arts contribute to the longevity of nations—not only by promoting personal comfort and by removing causes of internal strife and thus enabling large bodies of people to dwell happily together but also by increasing their military power. Every nation which has achieved greatness has cultivated assiduously both the arts of peace and the arts of war. Every nation which has long maintained that greatness has done so by maintaining the policy by which she acquired it. Every nation which has

attained and then lost greatness has lost it by losing the proper balance between the military and the peaceful arts; never by exalting unduly the military, but always by neglecting them and thereby becoming vulnerable to attack. In other words, the history of every great nation that has declined shows three periods, the rise, the table-land of greatness, and the decline. During the rise the military arts held sway, on the table-land the arts of war and of peace are fairly balanced, during the decline the peaceful arts held sway."

The author then makes inquiry as to how long a nation can remain on the table-land.

"As long as she continues to adapt her life wisely to her environments, as long as she continues to be as wise as she was while climbing up; for while climbing up she not only had to exert force, she had also to guide the force with wisdom. So we see that in the ascent a nation has to use both force and wisdom; on the table-land wisdom; in the decline neither."

In the consideration of the struggles and lives of nations it is shown that the trend of people up to the present time in history is that nations have been and are moving in the direction not toward increasing the prevalence of peace but rather toward increasing the arts and areas of wars. Furthermore it is shown that no forces, such as civilization or commerce or Christianity, exist to-day that can change this trend. From these considerations the author reaches the inevitable conclusion that to remain on the table-land of its civilization and national life this country must not neglect the arts of war. He next proceeds to deal with that part of the art of war embodied in "The Navy as a Fighting Machine."

On the opening page of the book the inquiries are made,

"What is a navy for?

"Of what parts should it be composed?

"What principles should be followed in designing, preparing and operating it in order to get the maximum return for the money expended?"

Admiral Fiske deals with these questions on broad lines, pointing out the general principles involved and reaching his conclusions by that simple style of logic peculiar to the author, so easy to follow, and yet convincing to the expert and to the layman.

General considerations are discussed under the headings of Naval Power, Naval Preparedness, Naval Defense and Naval Policy.

Describing the manner in which navies have been employed in past wars he finds that, "These wars show us, as do all wars in which navies have engaged, that the function of a navy is not only to defend the coast in the sense of preventing an enemy from landing on it, but also to exert force far distant from the coast. The study of war has taught its students for many centuries that a merely passive defense will finally be broken down, and that the most effective defense is the offensive-defensive." A striking example of this is given in Nelson's defense of England which was conducted not on the coast of England but far at sea, wherever the enemy's fleet was found; in the Mediterranean, in the

West Indies, or in the Atlantic Ocean. An effective navy must be able to exert actual physical force on the ocean at any point where a nation's interests are threatened.

Sea power, used in the ordinary acceptation of this term, is defined as naval power and the importance of this power will increase with the increase of commerce and the expansion of nations.

In naval preparedness "The vital struggle of a war takes place before a shot is fired," and in naval defense the essential requirement is that it should be adequate.

The author attaches much value to having a naval policy, and to be efficient such a policy must accommodate itself to rapid changes in international situations. The material, the personnel and operation of our navy have suffered through lack of a naval policy. In policy and in policy's first cousin, strategy, this country is far in the rear. In formulating a policy for this country the suggestion is made to make use of the method of the "Estimate of the Situation" so successfully employed in solving military and naval problems.

Under the head of naval strategy Admiral Fiske discusses general principles of strategy, designing the navy as a machine, preparing the fleet, reserves and shore stations, naval bases, and operating the machine.

The general principles of strategy are learned by the study of war and of the campaigns of great commanders and by tactical games and war games. There is war strategy and preparation strategy, and of these two, preparation strategy is by far the more important. There is an intimate concern between strategy and policy; strategy is the concern of the military, but policy is the concern of the government. The work of strategy is to determine the kind of machine required for war, to prepare it for war, and to direct its operations during war. Equally important with the training of the fleet is the training of the general staff, both being parts of the machine, and stress is laid upon the necessity of close cooperation between the Navy Department and the fleet.

In all navies and equally in all armies the qualification that has been most important in personnel has been *character*, and to insure this all countries have trained a certain number of young men to be officers in the army and navy and developed in them the high character so essential in the line of duty. One cannot pursue a difficult path of duty unless his character is trained and his sense of duty so strong as to resist temptation.

Under the head of reserves and shore stations importance is attached to maintaining them in a state of readiness. "When war breaks out all routine is abolished and appreciating the value of starting a war by achieving some great success, and of preventing the enemy from doing so, military countries in recent years have advanced more and more their preparation during peace in order that, when war breaks out, they may be prepared either to take the offensive at once or to repel an offensive at once. Therefore the endeavor must be strongly made to have ready always all the ships and all the men that are to be added to the fleet."

The important subject of naval bases is discussed at length and their uses and requirements are carefully analyzed, and of particular interest is the application of these ideas to the situation of bases in the West Indies, Culebra, Samana, Guantanamo.

The last chapter of this book deals with the manner of operating the machine. "To win battles two things combine, strategy and tactics. The strategy of each side tries to arrange matters so that the forces on its side shall enter each battle with the greatest chance of victory; tactics tries to handle the forces with which it enters a battle in such a way that its side shall gain the victory. Strategy prepares for battles; tactics fights them."

Reviewing this publication in its entirety Admiral Fiske very ably presents his thoughts and ideas on nearly every important subject pertaining to naval problems. His discussions are broad and general. He points out principles involved which every officer should keep constantly in mind in considering the higher branches of his professional work.

The general trend of his conclusions is to the effect that in estimating the efficiency of the navy all the different parts should be considered, not separately, but as a whole and that the fleets on the sea, the stations on shore, and the Navy Department itself must be cemented into one compact combination as a fighting machine.

With a few changes in the terms employed, practically all the principles enunciated, and practically all the conclusions reached apply obviously to an army as well as to a navy; in fact, to national defense itself. This book deserves careful reading by all officers of both services and by everybody interested in the defense of his country. F. F. F.

"The Graves Papers, and Other Documents Relating to the Naval Operations of the Yorktown Campaign." Ed. by French Ensor Chadwick, Rear Admiral, U. S. N. (New York: Printed for the Naval History Society by the De Vinne Press, 1916.)

The late Dr Emil Reich, in the course of his lectures at Oxford on the Foundations of Modern Europe, laid great stress on the naval engagement between de Grasse and Graves off the Chesapeake capes in September, 1781. "This all-important battle . . . . ," he declared, "which sealed the fate of Cornwallis, this naval Waterloo of the British, is one of the least noticed military events of modern times. Not one Englishman or American in ten thousand has ever heard the name of the Battle of Cape Henry. The full details of that clinching victory have never been published, and in books on the American War the battle is, as a rule, given neither its precise name nor placed in its right historical perspective. . . . . The battle off Cape Henry had ultimate effects infinitely more important than those of Waterloo. . . . . De Grasse's action entailed upon the British the final loss of the thirteen colonies in America."

In the volume under consideration "the full details of that clinching victory" are at last published, and Dr. Reich's estimate of its importance is amply confirmed. All available documents, from both British and

French sources, are printed in full, with editorial comment by Admiral Chadwick. These are preceded by an introductory essay which reveals fleet conditions in the latter part of the 18th century, reviews the naval campaigns on the American coast during the Revolution, and analyzes in detail the crowning action off Cape Henry. From this discussion it appears that neither de Grasse nor Graves had any conception of the issues of the battle or of the strategy involved. Graves lost because, instead of crushing the French fleet in detail, as he might very well have done, he clung to the antiquated "Fighting Instructions," which called for a formation parallel to the enemy's line. And although his subordinate, Hood, realized what ought to have been done—at least, after the event—it is clear that he failed to give his superior proper support during the battle.

Of course, the prime interest of the Introduction lies in the author's analysis of this obscure but decisive action, but his description of the clumsiness of fleet maneuvers in the 18th century, his comments on Rodney's so-called "breaking the line" at the Battle of the Saints, and his revelation of the easy-going inefficiency of both French and British naval commanders on our coast, are also most interesting and illuminating. It is refreshing, too, to discover that a historical essay, involving tactical analysis and a profusion of detail, can, nevertheless, be written in language as clear and incisive as is this Introduction. The following brief paragraph, which concludes the story of the Yorktown campaign and points its historical moral, will serve as an example of the author's simple and direct style:

"To show the low ebb to which we had fallen, it should be mentioned that Washington marched south with but two thousand Continentals and four thousand French. This fact alone shows the supreme importance of the French fleet. Without it there had been no American independence."

By clearing up the obscure circumstances of "this naval Waterloo of the British," Admiral Chadwick has performed an invaluable service. He has collected his evidence in the spirit of exact scholarship and infused it with the light of his professional knowledge. It would seem, therefore, that the judgment he renders on men and events must command acceptance. It is not too much to say that "The Graves Papers" is the most important contribution to American history in recent years. W. O. S.

"The Law of Contraband of War." By H. Reason Pyke, L. L. B. 314 pages. $4.15 net. (Oxford University Press, 1916.)

"To define and trace the origin and development of the fundamental principles of the law of contraband, and impartially to set forth the rules of which it consists as exemplified in the practice of the chief naval powers"—this is the task which Mr. Pyke sets for himself, and to which he comes equipped with admirable mastery of the materials and clearness of style.

The historical development of the rules here treated is naturally of less present interest than the modifications that have been made in the course of the European War. Completed in November, 1915, the book neces-

sarily cannot take into account the more recent of these changes, such for example, as the decision of the judicial committee of the privy council in the Zamora Case establishing the precedence of international over municipal law in prize court procedure, and the final abandonment of the Declaration of London by the Allied Powers.

In reality, however, the final action of the Allies in throwing aside the declaration need not be regarded as very significant, since they had already "pulled most of its teeth" long before. During the first year of the war, the British Government greatly extended the list of absolute contraband; altered the doctrine of continuous voyage so as to make it apply to conditional as well as absolute contraband; so modified the required evidence of enemy destination that goods consigned "to order" should be liable; and did away with the distinction between armed forces and civil population.

All these measures increasing the control exercised by belligerents over neutral trade Mr. Pyke takes up in detail and is inclined to justify, basing his argument on the general grounds of (a) ease of communication through adjacent neutral countries, necessitating the most stringent enforcement of the doctrine of continuous voyage, and (b) the mobilization of practically all the material resources of a nation for purposes of war.

It is sufficiently clear that strict observation of the Declaration of London would have deprived sea power of most of its advantages. To some American writers, indeed such a result has seemed desirable. Prof. Ellery C. Stowell of Columbia, in an able review of the present volume (N. Y. Nation, May 11, 1916), remarks that "The trend of all civilization towards specialization seems to warrant the hope that in the future wars may be more and more closely restricted to contests between highly specialized armaments . . . . without disturbing non-combatants and neutral trade." But, whatever the trend of civilization, the trend of modern warfare has been precisely the other way. Aside from the Utopian nature of Prof. Stowell's hopes, it seems at least debatable whether the best interests of humanity would be truly served by thus circumscribing naval power, or by any such limitation of the weapons and resources to be used by a nation when it turns to the last arbitrament of war. Those who desire such limitations, at all events, will not find much encouragement in the doctrines laid down in Mr. Pyke's treatise.

A. F. W.

"The Submarine Torpedo-Boat." By Allen Hoar. 204 pages. $2.00 net. (D. Van Nostrand Co.)

The author states in his preface that the volume is intended to be of interest to the general reader and also of value to the technical man and naval engineer, who, while not specializing in this line, is desirous of reliable information on the subject. The book is a little deep for the non-technical man and he will not find it easy reading, but the reader who has some knowledge of the building and handling of ships will find the submarine treated rather completely, very concisely, and technically in non-

technical language by an engineer who knows his subject. The author has evidently had access to much information concerning the submarines in the United States Navy and has used his opportunity well. He treats of the inherent characteristics of the submarine; of the problems involved in its design, construction and operation from the standpoint of both architect and engineer, comparing types, criticizing vessels now in service, and suggesting remedies for the faults he brings out. There are also chapters on the tactics of submarines, defense against submarines, the torpedo and the mine; good but not up to the standard of the rest of the book. Much of the ground covered is familiar to the submarine officer, but even he will find old theories restated in an interesting way, and he may read with profit the author's clear discussion of longitudinal stability and the factors involved in horizontal steering, as well as the remarks on the inherent defects in gasoline and heavy oil engines. The chapter on future developments is refreshingly sane. R. S. E.

"The Naval Architects', Shipbuilders' and Marine Engineers' Pocketbook." By Clement Mackrow, M. I. N. A., and Lloyd Woolard, M. I. N. A. $5.00 net. (Eleventh edition.)

The task of the reviewer is not to criticise but to judge books conscientiously on their merits. It is seldom, however, that a book is reviewed without at least a certain amount of criticism being passed upon it, and this is especially true of a handbook. It is therefore all the more to the credit of "The Naval Architects', Shipbuilders' and Marine Engineers' Pocketbook" that we can say only pleasant things of it.

The eleventh edition of this well-known manual has been revised with so much care that in spite of the addition of several new sections and many new tables there has been no increase in the size of the book. The principal additions are the chapters on Speed and Horse-power, and on Aerodynamics and Aeronautics which have been unusually well condensed. The information and data furnished concerning small craft and tugs will be particularly welcomed by those who must frequently refer to them but who have not the means of providing themselves with the full details of such a subject, for example, as propeller design, and who will be very glad to find the essentials of the subject in a handbook.

The cuts and illustrations are profuse, the tables up to date, the printing clear and distinct and the quality of paper and binding all that could be desired. The book is especially suited to the needs of British shipbuilders, however, as evidenced by the tables of British standard sections of steel shapes, ballistic tables of guns manufactured by British firms, tide tables, etc., and much other data of peculiar interest to British designers, builders and engineers.

The general arrangement of subject matter has been made with due regard to logical sequence, and one is impressed throughout with the discriminating taste shown in the selection of the subjects and the brief but thorough manner in which each one is treated. The book is essentially a practical one, prepared in the light of a large experience by men who know their profession. R. D. G.

"Military and Naval America." By Captain Harrison S. Kerrick, C. A. C., U. S. Army. Price, $2.00. (Doubleday, Page & Co.)

Captain Kerrick devotes about one-half of the 400 pages of his book to the army, one-quarter to the navy, and the other quarter to auxiliary elements of national defense such as the coast guard, boy scouts, military colleges, etc.

The needs of the army are set forth forcibly. The details of army administration and service activities are clearly explained in 23 chapters of good reading.

The navy is given a secondary place in the book. There are, however, 15 chapters on naval administration and service activities.

Seekers for information on army matters will, therefore, be particularly pleased with this compendium, including maps, diagrams, illustrations, index and glossary. C. C. G.

"Midshipman Stanford." By H. H. Clark, U. S. N. Postpaid, $1.35. (Boston: Lothrop, Lee & Shepard Co.)

This, the latest book by Chaplain Henry H. Clark, U. S. N., Retired, and dedicated to Rear Admiral Charles J. Badger, U. S. N., "sometime superintendent of the Naval Academy, in remembrance of the happy years of service under his command," abounds in interest to every American. Particularly will it appeal to all who have lived within the Academy walls. Nowhere else can such a vivid and accurate picture of the midshipman's life be found. Chaplain Clark writes with an easy and graphic pen, with an authority springing from the observations and experiences of a nineteen years' residence and as one who knows the Academy as few do.

The book follows the fortunes of Hollis Stanford, the ambition of whose young life was to secure an appointment to the Naval Academy. Failing in this, but determined to go to sea, he became a "deck cadet" on a ship of the Columbia Line on her passage from New York to Southampton. A terrific storm indirectly brings to him the opportunity vainly sought, as through the influence of a United States senator whose daughter he rescues, he is given a Presidential appointment. Once in Annapolis he joins the "army of the anxious," the numberless candidates who are attending various preparatory schools and who "have raised the boarding house business to a city industry." Then come glimpses of the life of the candidate with its dreads and hopes, the successful candidate carefully repressing his ecstasy because in a plebe it might be attributed to insanity or intoxication, his great regret, however, being that he is unable to obtain, to send home for preservation, the pen with which he signed his oath.

All through the book there runs a serious tone which keeps before the reader the loftiness of the Academy ideals and traditions, and the necessity for unflagging vigilance and hard work which alone can enable

the midshipman to measure up to the constant demands which meet him as part of every day's routine. There are delightful bits about the first plebe dinner formation, the "midshipmen's Bible," the complaint about the scantiness of the furniture as contrasted with Vassar or Bryn Mawr, the plebe's emotions at his first drill, "to the multiplied changes of which the new wicked dances would have been child's play," which will recall to many a "former plebe" memories of his own verdant days. There are, too, glimpses of by-gone times, when "running" and "rates" were the order of the day, and "hazing" proper, the order of the night, with a catalogue of joy-rides and other unpatented Academy inventions.

The account of Stanford's plebe year, with his introduction to the Christmas tree, "the only one in the world that hangs with bitter fruit," the Christmas morning fun when the plebe is in the saddle, his first experience with the "semi-anns" and Tecumseh's failure to respond to calls for help, will strike many a sympathetic chord.

For four years the reader follows the joys and sorrows of Stanford's Academy life—seeing him reminded at every turn of the great purpose of the institution, and stimulated and guided to make good in his own character the noble traditions of the place. Even the practice cruises are included, summer by summer—vivid pictures of London and the Henly races at one time; at another of Naples, Pompeii and Rome, or of a summer on the ships of the Atlantic fleet—will show the completeness with which the author has completed the task he set for himself.

Nor is the story of Stanford's love affair forgotten, and, in spite of all obstacles, a wedding is in sight as the book closes. S. K. E.

"Life at United States Naval Academy." By Commander Ralph Earle, U. S. Navy, Head of Department of Ordnance and Gunnery, United States Naval Academy. $1.50 net. (New York: G. P. Putnam's Sons.)

The book provides a detailed description of the midshipman's life at the United States Naval Academy at Annapolis, Maryland, the great institution that educates the youth of this country for the life profession of a naval officer. It is to explain to boys desirous of entering the navy as an officer, to their parents, and to others interested exactly what the Naval Academy and the navy offers as a career, together with the manner in which the education and training of the midshipmen is accomplished.

A brief historical sketch is included in the first chapter that points out how the establishment of this excellent school was gradually forced upon this nation by the ever growing demands of the naval service.

Then follows a recital of the methods of obtaining an appointment from the Navy Department that entitles one to take the entrance examinations that are open alike to young men in all walks of civilian life and to the young enlisted men of the navy and marine corps. The education that the boy should have before attempting to enter, as well as notes as to the advisability of preliminary coaching are given in much detail.

The maximum number allowed by law, prior to the Act of August, 1916, was 1094, but in the future it will be 1762. Thus did Congress recognize that our navy required a greater number of trained officers than the Naval Academy had been turning out yearly.

The book then thoroughly follows his procedure in entering and his first summer's course, after which it takes the midshipman through the course not by years, but by clear discussions of the various activities that make up his daily life. The recitations, drills, practice cruises, physical training, medical care, athletics, recreations, and the career that the navy affords one after graduation are related in a manner that will make the midshipman's life easily understood by his parents and friends, and also show the boy intending to enter the Academy just what he may expect there.

The high moral tone, the discipline, the organization, and the methods by which responsibility is implanted and the whole character of the midshipmen molded to service standards by the four years' progressive training and preparation under the guidance of the seamen who compose the faculty of the Academy, are all recounted in a plain and logical manner. Thus is made clear how the boy is developed into the officer and gentleman demanded by the traditions of a most honorable service and expected by the people of this country. In other words, the book places the very *atmosphere* of the institution and its ideals before its readers.

Many illustrations are provided in order that the general impression of the life at Annapolis given by the book may be aided by views of various activities as well as of the grounds and buildings in which this life takes place.

The splendidly equipped Naval Academy is a necessary part of any scheme of national defense; the methods and appliances used in modern war upon the sea can no longer be developed by the hard, simple and inefficient process of practical experience in the ships or fleets at sea, but require an education in the best scientific school that man can produce.

Appendices provide the detailed information that might be desired prior to entrance, such as the physical requirements and sample entrance examination questions, together with the courses of study and the textbooks now used at the Academy.

"Transactions of the North-East Coast Institution of Engineers and Shipbuilders." Vol. 32, for 1915-16.

The address of the president, Mr. Herbert Rowell, gives a brief but interesting sketch of developments in naval construction during the first year of the war. Among other articles may be mentioned "Notes on Model Experiments," by G. S. Baker; "The Standardization of Stability Curves," by Wilfrid Ayre, and "The Business Part of Science—Its Part in the Coming Economic Crisis," by T. C. Elder.

"The Transactions of the Institution of Naval Architects (England)." Vol. 58, 1916.

Contains articles in the main strictly technical, though some are of more general naval interest. Among the latter may be mentioned: "A Summary of the Present Position of the Marine Diesel Engine and its Possibilities, by Lieut. Commander W. P. Sillince, R. N.; "Strength of Watertight Bulkheads," by J. F. King; and "Notes From a Collision Investigation (*Empress of Ireland-Storstadt*). By John Reid. Nearly one-fourth of the volume is occupied by excellent plates and illustrations.

NAVAL ACADEMY GRADUATES' ASSOCIATION

The seventy-second academic year opened with the largest number of midshipmen in the history of the Naval Academy. The distribution amongst the four classes was as follows: First class, 185 members; second class, 208 members; third class, 214 members; fourth class, 625 members; making a total of 1232 midshipmen at the Academy. The maximum number permissible is about 1760. The size of the regiment has taxed the capacity of Bancroft Hall to the limit, necessitating placing as many as four midshipmen in one set of rooms, designed originally for two.

Your secretary has already been informed by the commandant that in the event of our next reunion being held in Annapolis, it will be impossible to furnish quarters in Bancroft Hall for the graduates, as has been the custom heretofore. This may serve as another "talking point" for those who advocate the annual reunion and dinner being held in some place other than Annapolis.

To handle this large number of midshipmen a considerable increase has been made in the teaching staff, forty-two new civilian instructorships were authorized, and have been filled with the exception of six in the department of mathematics.

During the week ending November 4 the Academy was visited by a board of army officers from West Point. The commandant of cadets, adjutant, and the heads of the departments of mathematics and English comprised the board. West Point will be called upon to solve the problem of a large increase in the number of cadets, and the purpose of the board was to gain an insight into our methods of handling the large increase in number which the Naval Academy has had in the last few years.

The 1916 edition of the Naval Academy Graduates' Register has been received and will be mailed to the members as rapidly as possible. Several errors have been noted so far, and others will no doubt develop, but in the main it will be found as complete and accurate as the files of the Association could make it possible. There are still a few extra copies of the bound books on hand, and any who may desire can obtain one on the payment of one dollar. Extra paper copies can be had for fifty cents a copy. The

list of "changes in register," as given later, refers to the 1916 edition.

The design for the Corbesier Memorial Tablet is still in the hands of the contractor. Several tentative designs have been submitted and were rejected, so that the artist is still at work.

As the Farragut Memorial Window Committee has not had a meeting for over a year, the secretary of that committee was requested to furnish some information in regard to the status of the project. The full-size working drawings have been completed and are to be sent to the Academy in the near future that they may be passed upon by the Board on Memorials. The secretary also enclosed a copy of a circular to be sent out by the committee. This is given in full below:

UNITED STATES NAVAL ACADEMY GRADUATES' ASSOCIATION

FARRAGUT MEMORIAL WINDOW COMMITTEE

WASHINGTON, November 1, 1916.

To the Graduates of the Naval Academy:

In the spring of 1913 the Naval Academy Graduates' Association, at its regular annual meeting, by a proxy vote of 790 "yea" to 128 "no," determined upon the erection at the Naval Academy in the new chapel of a stained glass window as a memorial to Admiral Farragut. The windows of the chapel are, by executive order, reserved for officers who commanded squadrons or fleets in action and who were conspicuously pre-eminent among naval officers of their day. There is only one large window remaining empty in the chapel; public opinion is almost unanimous that it should be given to the memory of Admiral Farragut. The permission of the Navy Department for the erection of the window has been granted.

A committee was appointed by the Council of the Graduates' Association to solicit funds and to erect the window. This committee is working *for you*, at the request of *your* representatives, the Council of the Association, and should receive your grateful support. The committee is:

REAR ADMIRAL J. C. WATSON, U. S. Navy, *Chairman*,
THE SUPERINTENDENT OF THE NAVAL ACADEMY, *ex officio*,
REAR ADMIRAL A. W. GRANT, U. S. Navy,
HON. J. W. WEEKS, U. S. Senate,
CAPTAIN S. S. ROBISON, U. S. Navy,
COMMANDER C. T. JEWELL, U. S. Navy, *Secretary-Treasurer*,
PROFESSOR D. M. GARRISON, U. S. Navy,
Secretary-Treasurer of the Graduates' Association.

An artist has been secured, and a tentative design accepted. The working drawings have been twice submitted to the committee and to the Board

on Memorials of the Naval Academy, but are still in the artist's hands receiving some minor changes. Before final acceptance, the designs must also be approved by the Federal Fine Arts Commission, a member of which is now advising the committee. The design is pronounced almost epoch-making in the history of American modern stained glass.

A contract for the erection of the window has been signed with the Gorham Co., New York.

In the fall of 1914 the committee sent out a circular telling of the progress made towards securing a design, and asking for subscriptions. The next year an appeal for funds was issued by the Council of the Association. It is well known that the first circular did not reach a large number of graduates, through no fault of the committee. The second circular was sent only to those who had not subscribed their full quota. But it is known that the second circular also did not reach all whom it was intended to reach.

The committee has therefore decided to issue a new appeal.

The amount needed by the committee to secure the design, erect the window and pay all the expenses incident to the work, is $10,000. We have in hand a little over $6000. There remains to be subscribed nearly $4000.

To date about 1200 graduates have subscribed; about 1800 living graduates have not yet subscribed. The amount asked from each graduate is $5.00.

By a vote of the Association itself, the subscription list is closed to all who are not graduates.

Many graduates have offered to increase their subscription; some graduates have agreed to raise between them the entire sum still required. All these offers have been gratefully declined. The purpose of this movement is to present a gift to the Academy from the whole body of graduates as a token of their appreciation of the Academy and of what it has done for them personally and for the nation at large. The movement fails in its object unless the graduates as a whole rally to its support.

This circular is being sent, together with a statement of the amount he has already subscribed, to each graduate who has not yet paid his full quota. A prompt response is earnestly requested. The window is sure to be erected eventually; eventually you will want to be enrolled among its donors. Please save delay, trouble and worry to the already overworked committee by responding promptly.

Make checks payable to "The Farragut Window Committee," and forward to the treasurer.

By direction of the committee,

C. T. JEWELL,
Commander, U. S. Navy, Retired,
Secretary-Treasurer.

Address:
C. T. JEWELL,
2135 R Street, N. W.,
Washington, D. C.

ERRORS IN 1916 REGISTER

826 Moser, J. F. Ret., Sept. 29, '04. Capt., not R. Adml.
1301-1302, between; should read: "Cadet Midshipmen."
1840 Caldwell, William Howell. Not dead. Address: Hillsboro Dredging Co., Tampa, Fla.
1876 Peckham, Henry Lincoln. Add: * Served in Spanish War.
1914 Robison, Samuel Shelburn. Not Robinson.

CHANGES IN REGISTER

488 Class '61 Johnson, Henry Lewis. Died, Aug. 18, '10, Burlington, Vt.
550 " '63 Rathbone, Clarence. Died, Apr. 23, '16, Albany, N. Y.
557 " '63 Cook, Francis Augustus. Died, Oct. 8, '16, Northampton, Mass.
758 " '67 Mitchell George Justice. Died, July 3, '16, Pomona, Cal.
1029 " '70 Vreeland, Charles Edward. Died, Sept. 27, '16, Atlantic City, N. J.
1138 " '73 Howard, Thomas Benton. Ret., Aug. 10, '16, R. Adml.
1188 " '74 Scott, Bernard Orme. Died, May 27, '14, near Phila., Pa.
1211 " '75 Winslow, Cameron McRae. Ret., July 29, '16, R. Adml.
1266 " '76 Boush, Clifford Joseph. Ret., Aug. 13, '16, R. Adml.
1339 " '77 Rush, William Rees. Ret., Oct. 9, '16, Capt.
1381 " '78 Dent, Baine Carruthers. Died, Oct. 10, '16, Vineland, N. J.
1919 " '88 West, Ernest Edward. Died, July 17, '14, Chattanooga, Tenn.
1966 " '89 Harrison, William Kelley. Ret., Sept. 29, '16, Comdr.
2148 " '94 Jones, Lewis Burton. Died, July 30, '16, Washington, D. C.
3209 " '08 Beisel, Fred Cornelius. Ret., Oct. 10, '16, Lt. (J. G.).
4160 " '14 Gilchrist, K. P. Died, Oct. 6, '16, Ens., Naval Hospital, Mare Island, Cal.
4367 " '15 Clark, Charles Glover. Died, Oct. 12, '16, Ens., Zamboanga, P. I.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-third year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

Sec. 8. The annual dues for regular and associate members shall be two dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be thirty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published every two months, and anyone may subscribe for them. The annual subscription is $3.00; single copies, 50 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1917

A prize of two hundred dollars, with a gold medal, and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award for the prize will be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1917. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the PROCEEDINGS of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the PROCEEDINGS of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

6. An essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

8. It is requested that all essays be submitted typewritten and in duplicate, if practicable; essays submitted written in longhand and in single copy will, however, receive equal consideration.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

J. W. GREENSLADE,
Lieut. Commander, U. S. N., Secretary and Treasurer

PRIZE ESSAY TOPICS

SUGGESTED AT THE INVITATION OF THE BOARD OF CONTROL

BY

THE PRESIDENT OF THE NAVAL INSTITUTE, THE SUPERINTENDENT OF THE NAVAL ACADEMY, THE PRESIDENT OF THE NAVAL WAR COLLEGE, AND THE COMMANDERS-IN-CHIEF OF THE ATLANTIC, PACIFIC AND ASIATIC FLEETS.

"The Mutual Relations of Gunnery and Tactics."

"The Place of the Naval Officer in International Affairs."

"The Evolution of Naval Doctrine from National Character."

"The Training of Enlisted Personnel to Produce Modern Man-o'-Warsmen: (a) Military Training; (b) Moral Training; (c) Education."

"The Organization, Employment and Training of Reserve Fleets and Flotillas."

"A Personnel Reserve for the Naval Service."

"Value of Speed as an Offensive Element in Battleship Strategy and Tactics, as Compared with Armor."

LIST OF PRIZE ESSAYS

1879

Naval Education. Prize Essay, 1879. By Lieut. Comdr. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut. Comdr. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut. Comdr. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut. Comdr. W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut. Comdr. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut. Comdr. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut. Comdr. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut. Comdr. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut. Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENCE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut. Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotton, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conrad, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut. Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut. Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut. Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-Day. Prize Essay, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. Navy.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

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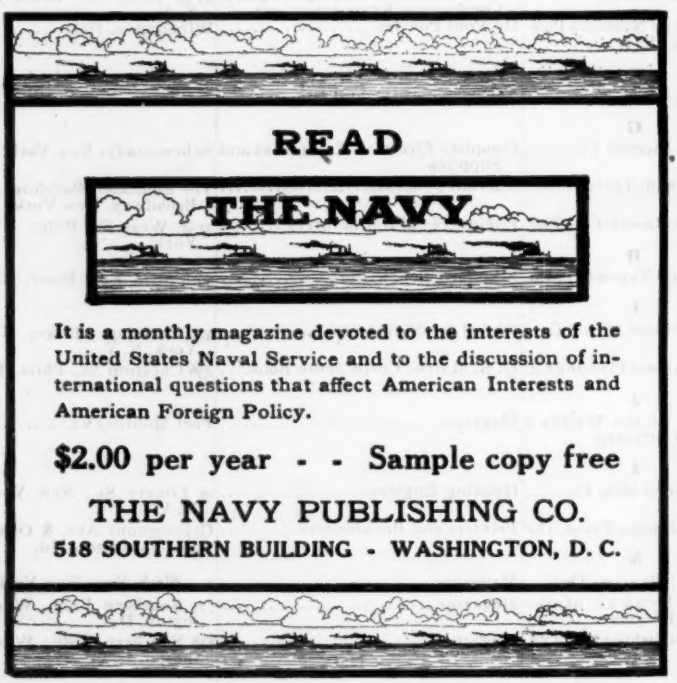
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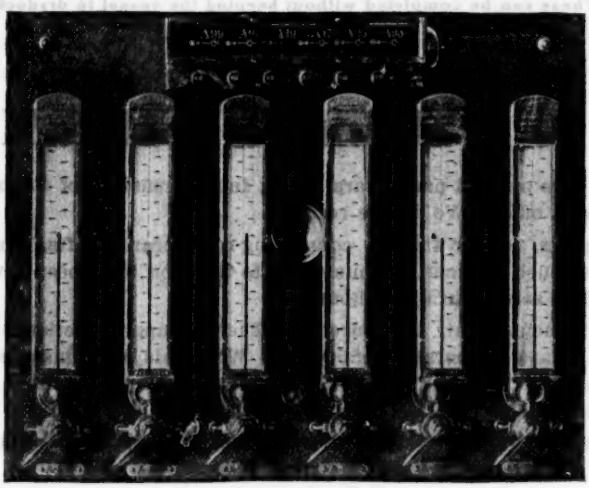

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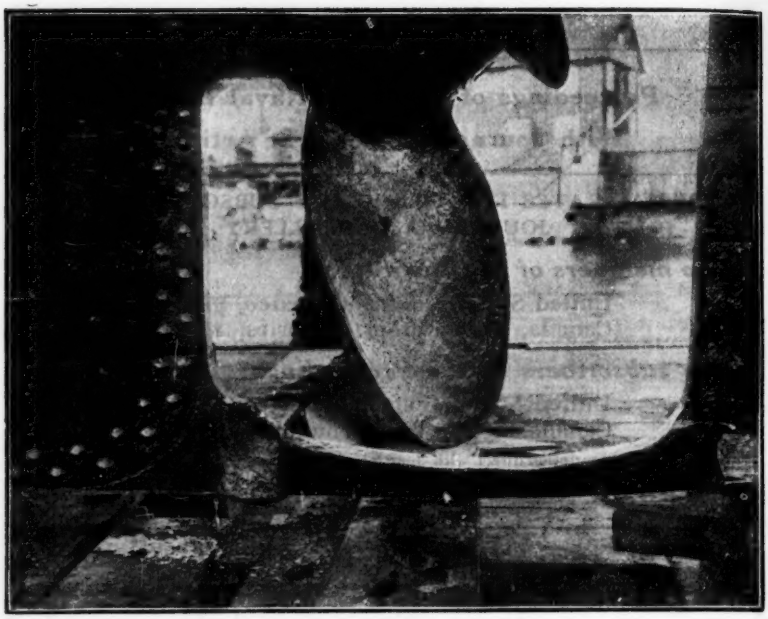

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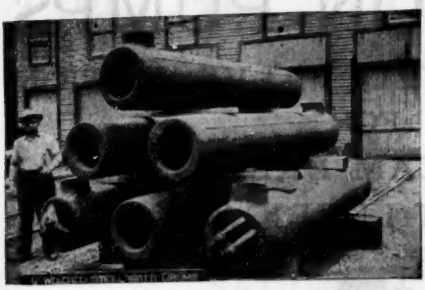

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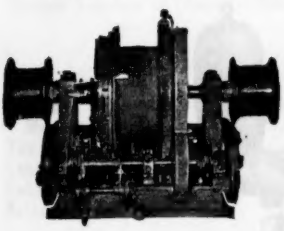

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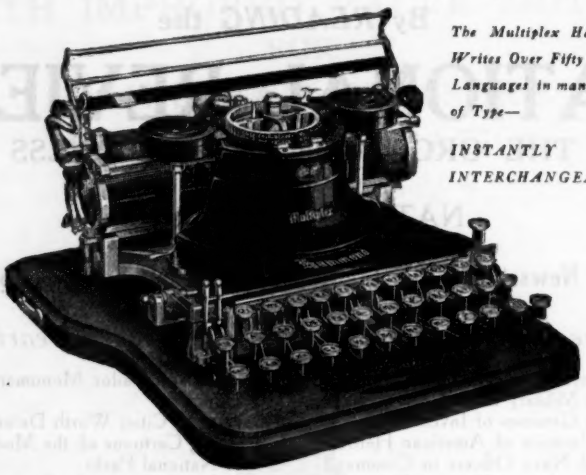

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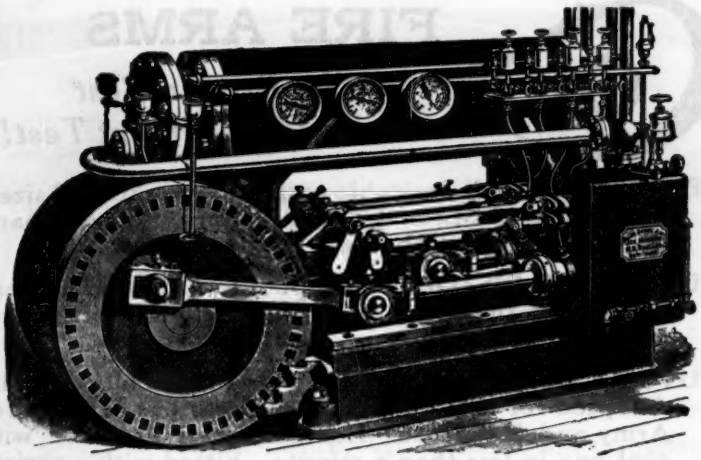

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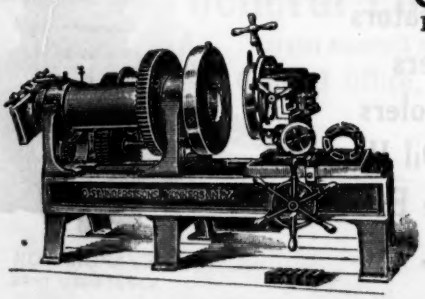

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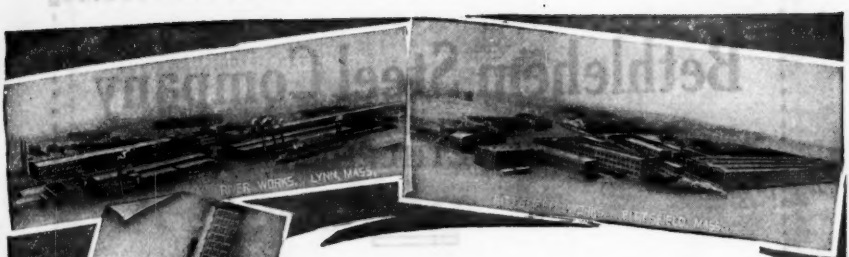

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